The FOUNDRY

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Castings Help Carry Iron Ore From Mine to Furnace

ONLY sixty or seventy years have been required to expand a few small ships sailing the great lakes to a gigantic inland, water-transportation system which serves many industries. Today, huge bulk freighters, of a peculiar design not found in other parts of the world, ply between the waters of Lake Superior and the ports on the southern lakes. These steel leviathans carry ore and grain on their trip from the northwest to the industrial cities on Lake Michigan and Lake Erie and coal on the return voyage. Although transportation on the large inland

Thousands of Pounds of Steel Castings Slide into the Water When A Modern Steel Boat Is Launched on the Great Lakes

waterway is limited to the season of the year when the lakes are free from ice, the yearly tonnage passing through the locks at Sault Ste. Marie, the gateway from the lower lakes to Superior, exceeds by several million tons the combined tonnage of the ports of New York, London, Liverpool and Hamburg. In addition to the large fleet carrying ore, grain and coal, many other ships sail the Great Lakes including package freighters, passenger ships and car ferries. Practically all of the modern boats are built of steel and castings play an important part in the construction. In the car ferry Wabash, which recently was launched at Toledo, 64,334 pounds of steel castings were used in addition to a good tonnage of nonferrous castings.

Find Where Castings Can Be Sold.

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Stepping Up Production

Removing Chance from Core Making

DELICATE sense of touch was considered such an essential qualification in molders engaged in heater foundries a few years ago that according to a popular tradition men from other lines seeking employment had to submit to having the ends of their fingers ground on an emery stone before commencing work. In the hands of a natural born amplifier, the story usually was expanded to the extent that particularly hard and calloused fingers were nipped off at the first joint to insure the proper sensitiveness at the ends or points of contact with the sand while engaged in tucking the sand under the bars.

Like the premature story of Mark Twain's death, which that gentleman in person mildly characterized as a gross exaggeration, it is probable that the finger grinding and finger nipping story will not bear too critical an examination. Opportunity to prove or disprove it has gone forever, because under present manufacturing conditions the human factor has been eliminated to a remarkable extent. Molds are made automatically and mechanically and in greater volume than ever before. They may be made with no greater precision, because this is a class of casting which must be perfect or it is worthless. There is no middle ground.

One of the principal points of difference between the new and the old methods, between machine and hand labor is that under the first method a definite production schedule may be maintained with reasonable certainty. Mechanical equipment knows nothing of birthdays, wedding anniversaries, ball games, funerals, that tired

Fig. 1—Showing Cluttered Condition of Assembling Shop Pile With Castings Before Conveyors Were Installed

Mechanically-I

By Pat Dwyer

THIS is the first of three articles by Mr. Dwyer describing the methods and equipment employed at one of the Buffalo plants of the American Radiator Co. Owing to the extent of the mechanical equipment installed in this plant the description has been divided into three parts, one dealing with the coreroom, a second with the sand handling and conveying equipment in the molding department and the third with the methods and equipment employed for handling the castings between the shakeout and the shipping platform of the plant.

feeling, blue Mondays, good jobs in another town or any other of the 57 reasons through which men lose time and through which the manufacturer loses production. The machine is on the job all day every day. It does not need to be driven or coaxed. It works at a constant speed and never grows tired. It turns out a uniform product and finally it harbors no resentment, starts no acrimonious argument and does not attempt to set up any palpably transparent alibi when the discount burial service is read over defective castings.

Mechanical equipment has been adopted extensively in all the plants operated by the American Radiator Co., and has been an important factor in the development of this company to its present position as the largest manufacturer of heating equipment in existence. Equipment in the Bond plant, one of the four operated by the company in Buffalo, was described in the March 15 issue of THE FOUNDRY. Illustrations in the present article are from photographs taken in the Austin Arcola plant which specializes in radiators and in one of the smaller size hot water and steam boilers.

This plant also is located in Buffalo and includes two separate foundries. One devoted exclusively to the manufacture of radiators and the

Fig. 2—Same Section After Installation of Conveyors Had Removed Much of the Excess Stock from the Floor

Fig. 3—View of the Coreroom Taken from the Side on Which the Cores are Made. Fig. 4—General View of One Side of the Coreroom showing the Transfer Car and Work Benches

second to the production of boiler sections and other necessary accessory parts. It is located on the site of a former copper refinery at one time operated by the Calumet & Hecla Copper Co., when copper concentrates were shipped down the lakes and refined with cheap electric current generated at Niagara Falls. Several years ago the copper company erected a refining plant at Houghton, Mich., and the Buffalo property remained idle until it was taken over and adapted to the use of the American Radiator Co. The site by the river has proved a desirable asset in the convenience it offers for shipping some of the incoming and outgoing freight.

In a tour of the plant, the logical starting place is the coreroom, because it is here the first active foundry operations begin. A supply of cores must be maintained in advance of the molders' requirements. On account of the exceedingly severe service to which the cores are subjected every feature connected with their production is kept under the strictest inspection. Absolute uniformity is maintained in the character of the sand, the binder, the method of mixing and the time and temperature under which the cores are baked in the extensive battery of ovens.

Clean, sharp sand, bonded with oil, is used in making the cores. The sand is selected carefully from a dependable source of supply and before it goes into the mixer it is passed over a vibrating screen made by the Niagara Concrete Mixer Co., Buffalo. Occasionally small roots and other foreign material appear in the sand as it comes from the bank, and this preliminary screening assures an absolutely clean and uniform product passing into the mixer. In their position in the mold the cores are entirely surrounded by molten iron with the exception of one and sometimes two small prints through which all the gas has to escape. The cores are comparatively light and fragile with little thickness at any point and from this it is apparent that the presence of any foreign material, particularly any combustible material, inevitable would set up a commotion that would cause the casting to be rejected.

Mix the Core Sand

Mechanical equipment in the core room insures a dependable, uniform product and leaves little to the fallible judgment of the operator. The screened sand is lifted by a bucket elevator and loaded into a storage tank located above a tilting, open-top, steel vessel designed to revolve at almost any angle between the horizontal and vertical. In a word it is nothing more nor less than one of these familiar machines originally built for a concrete mixer.

Sand from the tank falls by gravity into a measuring hopper which discharges in turn into the open top of the mixer, now in a vertical position. The operator swings the vessel to a suitable angle from the perpendicular and starts it revolving. A measured quantity of oil under pressure is sprayed over the sand while in motion. A water spray is located close to the oil pipe and a sufficient quantity of water is sprayed over the sand to bring it to a good workable condition. The relation of the sand and oil is fixed definitely in the proportion of approximately 1 to 60, but the water is a variable factor on account of the condition of the sand as it comes from the storage piles. The

Fig. 5—Showing a Battery of Trucks as They Appear Loaded with Green Cores and Ready to Go into the Ovens.

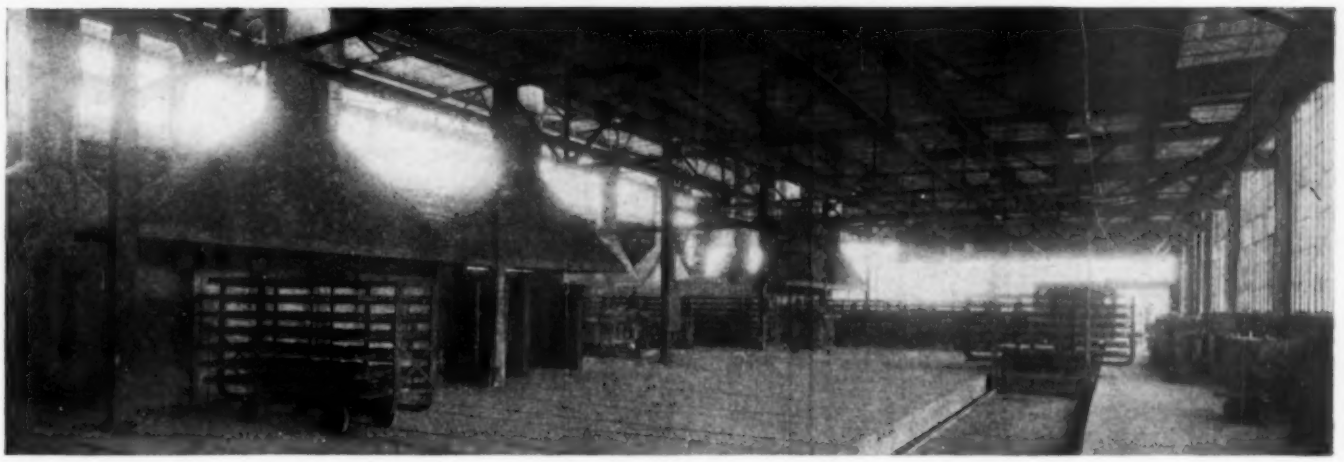


Fig. 6—A Second Transfer Car on the Cooling Side of the Ovens Shifts the Cars so they May Be Returned to the Loading Side

proper amount of water is decided by the operator who bases his judgment on the feel of a few handfuls. The core binder is prepared on the premises from a mixture of linseed oil, crude oil and rosin. The exact proportion of each most suitable to this particular plant has been determined in the extensive research laboratory which the company maintains in Buffalo.

The principle underlying this sand mixer is different from that usually employed. As the barrel revolves the sand is carried part way up the sides by the combined efforts of centrifugal force and a few fixed paddles. The sand constantly keeps falling back on the mass in the center and on the bottom and in that manner an intimate mixture is secured with a minimum amount of effort and without any pressure on the body of sand. The result approximately is the same as when a molder mixes a small quantity of sand on the bench with his hands. Each batch is mixed in a remarkably short time and then the prepared sand is dumped into a box mounted on an electric truck which distributes the sand to the various coremaking stations.

Venting the Cores

Two of the combined sand bins and work benches are shown in the foreground in Fig. 3 and a long line of the same devices as they appear on the coremaking side of the building in which the cores are made, dried and assembled for shipment in the molding department, is shown in Fig. 4 on the far side of the depression in the floor. A transfer car operating in this depression takes a loaded rack car from any track near a work bench and places it on any of the tracks leading to the ovens. Loaded cars passing into the ovens are shown in the illustration Fig. 5, while the same cars, loaded with dried cores are shown ready to emerge from the opposite ends of the same ovens in Fig. 7.

A certain degree of skill and a deftness conducive to high speed, characterizes the actions of the coremakers, but mechanical equipment has removed nearly all the hazard incident to this class of cores. Reference already has been made to the manner in which a uniform grade of sand is assured for the product day in and day out.

Cast-iron coreboxes insure a practically unlimited production of cores, exact duplicates in every particular. Although the boxes are light enough to be handled readily, they are ribbed strongly on the outside and thus resist breakage and distortion although handled under exceedingly rapid production conditions several hundred times each day. The two halves of the corebox are placed side by side and open side up on two steel bars that extend from side to side of each combined bench and sand container.

The operator fills each half of the box, presses the sand down with a section of steel plate, 5 x 10 inches, ½-inch thick and equipped in the center with a handle, and then scrapes all superfluous sand from the joint side of each half corebox with a suitable straightedge.

Two methods are employed for venting the core. In radiators and light boiler sections a flat plate with suitable projections on one side is pressed down on the joint face of each half core to form a series of vent channels converging to one or two common points where openings in the casting

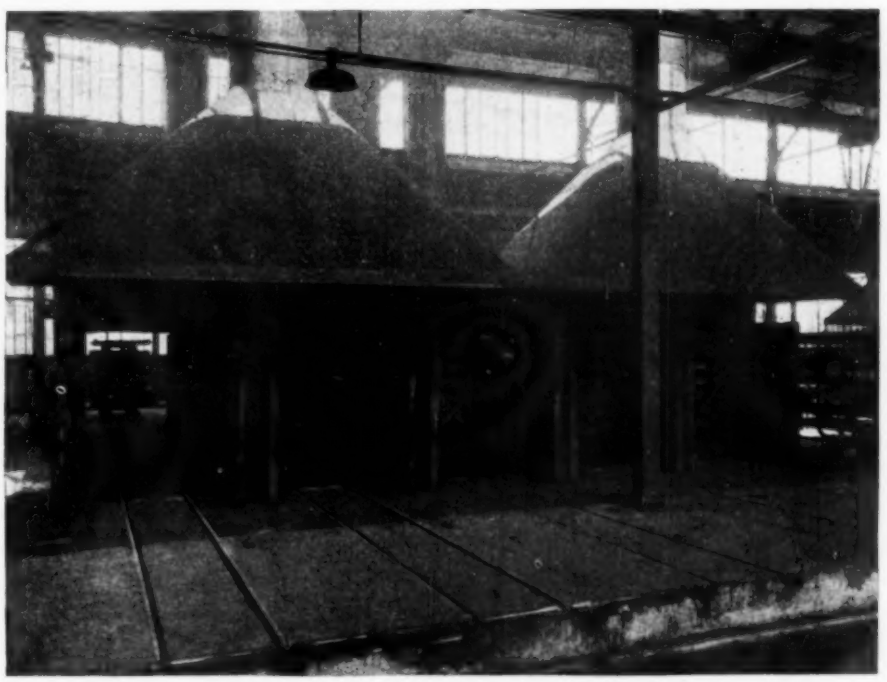


Fig. 7—After the Cores Are Dried They Are Removed Through the Far End of the Oven

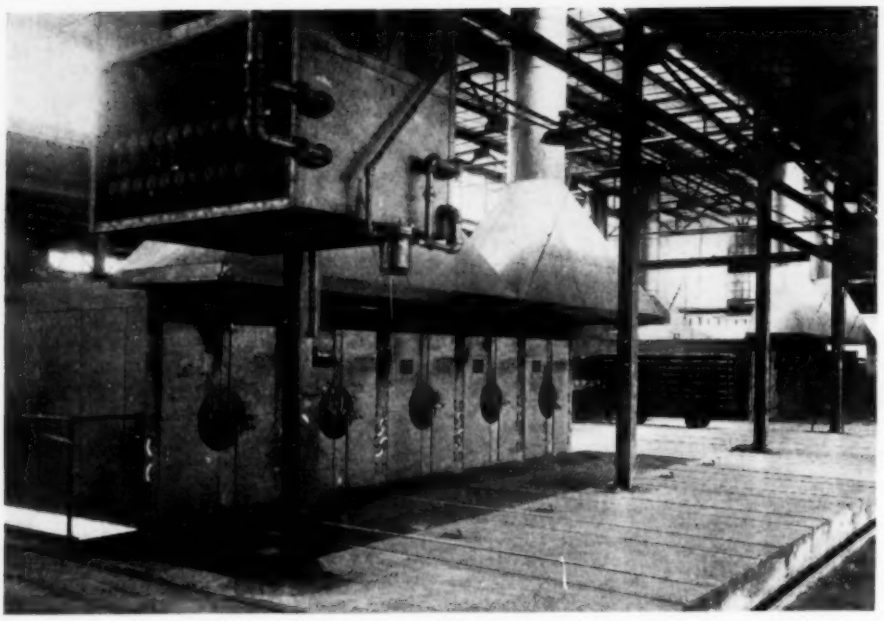


Fig. 8—Entrance to the Grating Covered Firing Pit in Front of the Battery of Ovens May Be Noted to the Left

provide a passage for the gas. In the second method employed with larger and thicker cores several long, straight rods ranging in size from ¼ to ½ inch, depending on the size of the core, are placed at strategic points in the corebox and the sand is rammed around them. The rods also are arranged in such a manner that all the channels left after their withdrawal will lead to one or more common exits for the gas. During the ramming operation the rods are supported in holes drilled for the purpose in the sides and ends of the corebox.

Dried in Iron Forms

The two half coreboxes filled with sand are turned up on edge face to face and joined while in a vertical position. Suitable guide pins bring them into proper relationship with each other. The assembled box and core then are lowered back to a horizontal position on the steel bars which extend across the sand bin. The upper half of the corebox is removed and placed in position to receive sand for another half core. The lower half of the corebox which now supports the entire core is lifted and placed on one of the nearby cars equipped with racks for the purpose. An empty lower half corebox is selected from a pile close to hand, placed in position on the bars close to the upper half and the entire operation is repeated by each man several hundred times each day.

From the foregoing it is apparent that only one upper half corebox is required, while lower halves must be provided in sufficient number to correspond with the number of cores made in a day. The lower halves of the corebox constantly are in circulation. For a certain part of each day they are on the outside of the ovens supporting green cores. Later they support the cores in the ovens and prevent distortion while the cores are subjected to a temperature of approximately 400 degrees for a period of 3 hours. Still later they remain on the racks on the cooling floor until the coves have been removed and finally they are piled close to the coremaking stations to take their turn once more in the endless procession. The box is cleaned carefully each time before it is used and is sprayed with gasoline.

Core ovens designed and built by the Swartwout Co., Cleveland are shown in several of the illustrations. Sheet iron hoods connected to suitable stacks at each end collect the fumes and smoke when the doors are opened and conduct them away from the coreroom. The ovens are located on what may be termed an island between two parallel transfer tracks and are provided with full size doors at each end. The cars loaded with green cores are pushed into the ovens at one end and a few hours later the same cars loaded with dried cores are removed through the doorways in the opposite end.

Oil Fired Ovens

Front view of the ovens showing the open spaces through which the heat ascends beside the rails is shown in Fig. 7. Interior of the firing pit under the grating in the floor is shown in Fig. 9. The equipment includes the oil tank and burners supplied by the Hauck Manufacturing Co., Brooklyn, N. Y., a pump for the oil and a turbo blower made by the Spencer Turbine Co., Hartford, Conn. The burners are under individual control so that the entire battery of ovens may be operated together or in any combination of units. Recording pyrometers enable the operator to gage the temperature closely and to hold it within definite limits throughout the baking period.

Effect of research, planning and equipment is reflected in the volume and the quality of the cores. For example each coremaker turns out approximately ten times as many cores as if he were working under ordinary

(*Concluded on Page* 574)

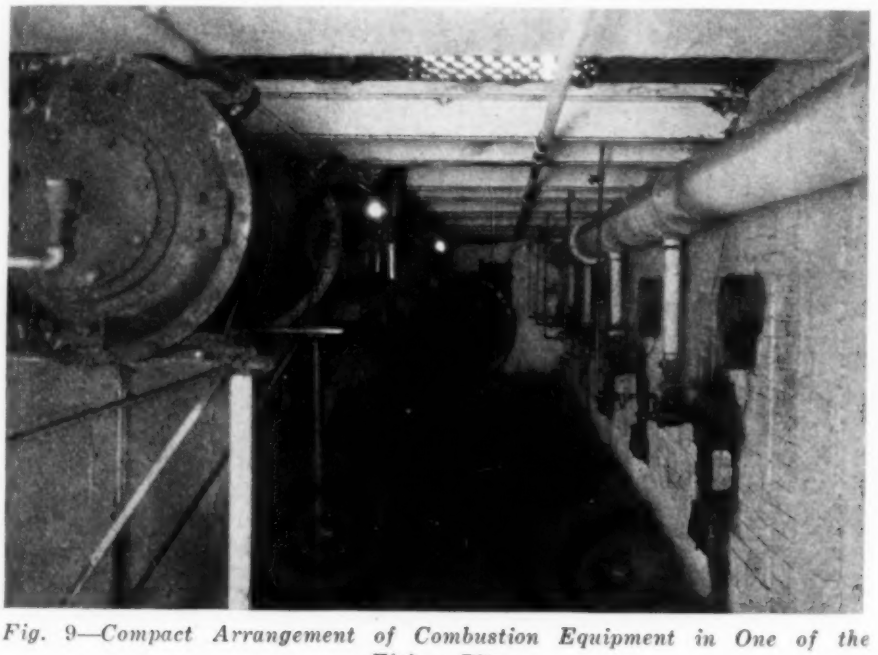


Fig. 9—Compact Arrangement of Combustion Equipment in One of the Firing Pits

TESTING SOCIETY MEETS In Western Resort

FRENCH LICK, Ind., chosen as the location for the convention commemorating the twenty-fifth anniversary of the incorporation of the American Society for Testing Materials, was the first western point selected for the annual meeting of the society since its organization. Nearly 600 members registered their attendance and participated in one or more of the twelve technical sessions and the great number of committee meetings held during the week of June 20-24.

Monday, June 20, was devoted to meetings of various groups of committees or sub-committees, of which more than 45 with 2000 members now are active in conducting the detailed business of the society. Morning, afternoon or evening sessions were held on the remaining days, terminating Friday night, June 24. The dinner, held Wednesday night was dedicated to the anniversary of the incorporation in 1902 and was featured by special honors paid to those individuals and firms that have been connected with the work of the A.S.T.M. since its incorporation.

Many matters of interest to foundrymen, either through their connection primarily with the subjects of metallurgy, manufacturing or testing metals or with the detailed methods by which standards for products of foundries are gaged, were discussed in five of the main sessions of the convention.

Presents High Test Iron Data

THE paper by M. E. Greenhow, Allis-Chalmers Mfg. Co., Milwaukee, read in the absence of the author by H. Y. Carson, American Cast Iron Pipe Co., Birmingham, Ala. at the session Tuesday afternoon gives a new ray of hope to the producer of gray iron castings. This paper gives detail methods of making a certain type of casting varying from ¼-inch to 1-inch section which had to be close grained, high strength and wear resistant.

The best results were obtained when the total carbon ranged from 2.75 to 3.0 per cent, to attain which steel scrap was used in the charge. The manganese varied from 0.75 to 0.90 per cent, and as higher losses were encountered than in ordinary cast iron, running at times to 25 per cent loss, a proportionately higher percentage was required. Silicon varied from 1.25 to 1.65 per cent. Nickel was used to replace a part of the silicon to reduce internal shrinkage.

The percentage substitution of nickel for silicon in this class of castings is 1½ times the silicon deduction in heavy castings to 2½ times in the lighter castings. For example, a certain casting which formerly required 1.25 silicon was reduced to 0.75 silicon with 0.75 per cent of nickel substituted.

The tensile strength of this material ran from 55,000 to 60,000 pounds per square inch. The brinell hardness was usually above 200, but the nickel-treated iron machined freely. The machineability of the nickel treated irons, according to test on castings of intricate design, was 33 per cent better than the same iron untreated.

The melting process in making this iron is of prime importance, and as the low carbon of the charge corresponds to a higher melting temperature, the coke to iron ratio was low. The steel stock charged was coil springs or short rail ends, and small charges were used in the cupola. With these smaller charges, increased coke was used, ranging from 1 to 6½ or 7, and the volume and pressure of the air blast were increased.

The initial bed charge is important. The bed charge was made up of 40 to 50 inches of coke above the tuyeres. This was ignited and burned to incandescence then an additional 6 inches of coke was charged and alternate charges of metal and coke were added until about 8 to 10 tons had been charged in the cupola. In making ladle additions all alloys were preheated on account of their higher melting temperatures.

A typical metal charge for a 36-inch cupola is given as follows: 1000 pounds, coil springs; 15 pounds of 50 per cent ferrosilicon. The ladle

H. F. MOORE, research professor of engineering materials, university of Illinois, Urbana, Ill., recently elected president of the American Society for Testing Materials, was graduated from New Hampshire college, Durham, N. H., in 1898. He received the degree of mechanical engineer from Cornell university, Ithaca, N. Y., in 1899 and a masters degree in 1903. From 1900 to 1901 he was connected with Colby academy, New London, N. H., and for the next three years was an instructor at Cornell university. From 1904 to 1907 he was assistant professor, University of Wisconsin, Madison, Wis., and since 1907 with the University of Illinois.

additions per 100 pounds of metal were as follows:

12 ounces, 70 per cent ferromanganese.

8 ounces, 50 per cent ferrosilicon.

24 ounces nickel shot.

T. D. Lynch, newly elected vice president of the American Society for Testing Materials, presided at this session which devoted to wrought and cast iron and magnetic testing. The report of the committee on malleable casting of which W. P. Putnam, Detroit Testing Laboratory, Detroit, is chairman, recommended tentatively the addition of a minimum yield point of 30,000 pounds per square inch, to be determined either by drop of beam or the divider method.

An outstanding feature of this session was the report of the committee on magnetic analysis. A. V. deForest, research engineer, American Chain Co., Bridgeport, Conn., gave a method for representing magnetic characteristics graphically. This method presents a graph of mechanical properties of ferro-magnetic materials and makes it possible to select from these the particular charactertistics of importance to the solution of any problem. For example the difference between tough and brittle specimens, or variations in heat treatment even in irregularly shaped specimens may be found without difficulty.

J. A. Capp, chief of the testing laboratory, General Electric Co., Schenectady, N. Y., gave a paper on the application of magnetic analysis to inspection of steam turbine bucket wheels.

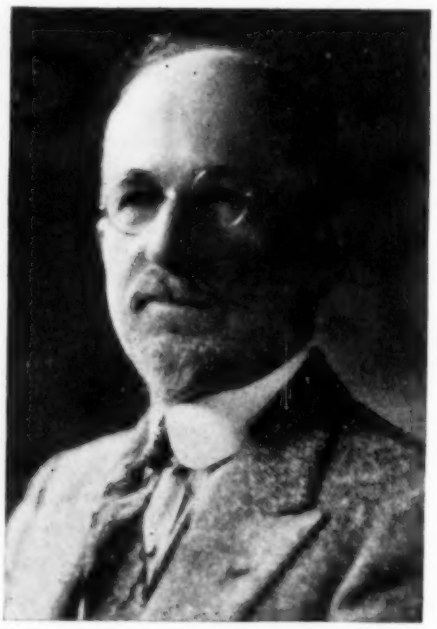
Steel Specifications Referred Back

SUGGESTED new specifications for carbon steel valves, flanges and fittings for high temperature service aroused unprecedented interest among the delegates at the thirtieth annual convention of the American Society for Testing Materials as is evidenced by an attendance of more than 200 at the morning session Wednesday. The discussion which was expected drew a large representation from the steel casting producing field, from organizations of foundrymen and from those interested only in the principle at stake.

However, this discussion did not materialize. When J. B. Young, Reading Co., Reading, Pa., the chairman of the general committee on steel submitted this portion of its report, the statement was made that the committee was by no means unanimous in its recommendations. In fact the analysis showed that 57 had voted affirmatively, 23 negatively and 66 had refrained from voting. Immediately, Prof. A. E. White, University of Michigan, Ann Arbor, Mich. representing the National Electric Light association, which is said to have backed the offending specification, moved that the specification be referred again to the committee. This motion was seconded and carried unanimously. President Gibboney, from the floor, commended the generosity of the consumer members of the steel committee for this action; and Major R. A. Bull, Electric Steel Founders' Research Group, Chicago, remarked upon the appropriate and gracious action of Prof. White.

Thus ended a situation which promised controversy, and in a measure the action reflected the popular judgement on the matter at issue. This particular specification, after three years' deliberation contained the statement:

"The steel shall be made by one or more of the following processes: open-hearth or electric-furnace."



TILLMAN D. Lynch, manager of material and process engineering department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., whose election as vice president of the American Society of Testing Materials was announced at the recent meeting at French Lick, Ind., was born in Harrison county, West Va., in 1867. He took preparatory work at the Academy of Buckhannon, Buckhannon, W. Va., and was graduated from West Virginia university, Morgantown, W. Va., in 1891. After graduation he joined the firm of G. W. G. Ferris & Co., Pittsburgh, remaining with this company until 1897. During the period of the Spanish war he was connected with the United States navy, bureau of steam engineering, doing inspection work. From 1899 he has been with the Westinghouse company, occupying the following positions: Inspector of raw materials, engineer of tests, section engineer, and manager of material and process engineering department. Mr. Lynch is a member of the American Society for Testing Materials, the American Society for Steel Treating, the Engineering Society of Pennsylvania, and the Phi Beta Kappa fraternity. He served as president of the A. S. S. T. in 1922 and was a director of the A. S. T. M. during 1925-26. He is the author of many important technical papers presented before national societies and in the technical press.

The dissenting members of the committee and many entirely disinterested parties, felt that in specifying these processes, the A.S.T.M. unfairly discriminated against the crucible and converter methods of steel making.

A second point of difference was found in that portion of the specification that gave physical limits and further set up the following requirements for chemical composition of the steel:

	Percent
Carbon	0.15-0.45
Manganese	Not under 0.50
Silicon	Not under 0.20
Phosphorus	Not over 0.05
Sulphur	Not over 0.05

The limitations placed upon carbon and manganese were not assumed to be unreasonable, but thus defining them was thought to constitute an invasion of the rights of the producer to make the castings according to his own best practice, as long as the physical requirements were met.

The American Foundrymen's association at its recent convention in Chicago passed unfavorably upon the specifications, and a steel session voted to refer a complaint to the executive committee of the American Society for Testing Materials which met Monday, June 20, at French Lick, Ind. Neither the executive committee nor the steel committee of the A.S.T.M., which met on the same day, felt free to stop the progress of the proposed measure at the stage to which it had advanced. The action on the floor of the convention, at the instance of Prof. White, cut the Gordian knot, and the offending specification again is returned to the general committee and through it to the sub-committee

which sponsored it in the first place.

John Howe Hall, Taylor-Wharton Iron & Steel Co., High Bridge, N. J. in presenting the report of the committee on heat treatment of iron and steel, commented upon the tentative definitions of terms relating to heat treatment operations. He called attention to some objection voiced to defining annealing as a heating and cooling operation of a material in the solid state. This definition with the remainder of the report was adopted, with the understanding that it will be amplified to take care of the variations in different lines of work.

E. F. Kenney, Bethlehem Steel Co., Inc., Bethlehem, Pa., who presided at this session, next introduced George K. Burgess, director, U. S. bureau of standards, Washington, who presented the report of the joint committee on the investigation of the effect of phosphorus and sulphur on steel. Dr. Burgess stated that a study is being made of the effect both of residual sulphur and that which is added to both fabricated and cast steel. No results of practical value have been found in the latter field and by recommendation of steel foundrymen, who point to the ill effects of hot shortness experienced in steel castings when the sulphur is carried above a minimum, this phase of the investigation probably will not be carried forward. Detailed results on test bars of open-hearth steel with varied carbon contents and with different amounts of phosphorus were presented. Work on the investigation of sulphur and phosphorus effects, according to Chairman Burgess, is being confined to materials at ordinary temperatures with no investigation of high temperature effects upon the steel studied.

John Howe Hall registered an objection to the loose application of the term manganese steel to material containing 2.85 per cent manganese, announcing that the term as understood in practice covers steel with manganese over 10 per cent.

F. M. VanDeventer, secretary of the joint research committee of the American Society of Mechanical Engineers and the A.S.T.M. reported studies going forward on the effect of temperature on the properties of metals, in 20 co-operating laboratories. Plain carbon steel, alloy steel and nickel are under investigation, but up to the present attention has been given largely to developing methods of testing. These show that greater uniformity of methods is desired.

The committee on ferro-alloys reporting through its chairman F. C. Langenberg, Watertown Arsenal, Watertown, Mass. reported that to limit the percentage of under or over-size lumps of spiegeleisen at present would not be commercial. However, ferro-silicon furnished in lump or granulated form is specified as showing no great disintegrations.

Honor Service to Organization

SPECIAL significance attached to dinner of the American Society for Testing Materials held Wednesday, June 22, since it commemorated the twenty-fifth anniversary of the incorporation, which was effected June 12, 1902. Past-president W. H. Fulweiler, who presided, read the roll of individual and firm members who have been continuously affiliated with the society since that date. Of a total of 66 individuals, 17 of the veterans were present and were signalled out for expression of appreciation. James H. Gibboney delivered the anniversary address.

C. L. Warwick, secretary, then presented the names of three men for honorary membership. These are Robert W. Lesley, William R. Webster and A. A. Stevenson. Only Mr. Stevenson was present to receive the honor conferred. Mr. Warwick reviewed briefly the technical accomplishments of the three. Robert W. Lesley, Surface Combustion Co., Philadelphia, was a pioneer in the use of cement and concrete, starting with the American Cement Co., in 1880. He established the *Cement Age* and was the first president of the cement association. He was president of the A.S.T.M. from 1900 to 1902.

William R. Webster, the second recipient of honorary membership, was an early investigator of the relations of chemical to physical properties in iron and steel. He became a member of the International testing society in 1898 and was one of the incorporators of the A.S.T.M. He was the first chairman of committee A-1, on steel.

A. A. Stevenson, Standard Steel Works Co., Philadelphia, the third member honored was the first chairman of the iron and steel committee of the American Institute of Mining and Metallurgical Engineers. Later he was president of the Association of Steel Manufacturers and during the War was chairman of the gun howitzer production club. He was a member of the International testing society in 1896, before the organization of the American section. He was vice chairman of committee A-1 and served on the executive committee of the A.S.T.M. from 1911 to 1920. He was elected president in 1916 and at present is the society's representative on the American Engineering Standards committee. In his address of appreciation, Mr. Stevenson pointed to the existence of more than 20,000 specifications for 6600 commodities and affirmed that study and simplification of existing standards is imperative.

H. F. Moore, president elect, introduced D. J. McAdam, Jr., U. S. naval research laboratory, Bellvue, Anacostia, D. C. who was presented with the Charles B. Dudley medal in consideration of his paper offered in 1926 on the methods of testing and the effects of corrosion and repeated stress on metals.

Scan Society's Accomplishments

FOLLOWING a day spent on committee deliberations, the thirtieth annual convention of the American Society for Testing Materials was called to order by President J. H. Gibboney, chief chemist, Norfolk & Western Railway Co., Roanoke, Va. on June 21. In his opening remarks, the president dwelt upon the growth and increasing usefulness of the society in promoting knowledge of engineering materials. Wear resistance is suggested as a future line of investigation by the president.

Prof. H. F. Moore, University of Illinois, Urbana, Ill., presented the report of the committee on correlation or research, showing many important

investigations promoted directly by the A.S.T.M. or carried on jointly with other technical organizations. Among other activities is a series of tests on the method for determining yield point of structural steel, a study of corrosion-resistant alloys and the effect of temperature upon properties of metals.

C. L. Warwick, secretary of the society, in reporting on the activities of standing committees, reviewed the classification of committee memberships as established by the society, into producers, consumers and general interest. The latter group is made up of engineers, educators and others who are neither producers nor consumers. A number of changes were made in the mode of operation of committees, including the provision that a two-thirds majority of a committee shall approve a report before its submission to the society, and dissenting members shall have a right to present a minority report. Editorial sub-committees to standing committees, having as their duty the review of present standards and of proposed new ones, is proposed by this committee.

The announcement of the election of officers by a committee which canvassed the ballots showed the following new officers who assumed their duties at the close of the convention: President, H. F. Moore, professor of engineering materials, University of Illinois, Urbana, Ill.; vice president, T. D. Lynch, manager, materials and process engineering department, Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.; members of the executive committee, F. O. Clements, director of research, General Motors Corp., Detroit; W. H. Klein, general superintendent, Dixie Portland Cement Co., Richard City, Tenn.; F. C. Langenberg, metallurgist, Watertown Arsenal and Climax Molybdenum Co., New York; and F. N. Speller, metallurgical engineer, National Tube Co., Pittsburgh. The adjournment of this session was followed immediately by the convening of the session on wrought and cast iron and magnetic testing.

Consider Corrosion and Wearing

CORROSION, endurance and wear testing occupied the attention of the metals division at the session held Thursday morning under chairmanship of H. F. Moore, University of Illinois, Urbana, Ill. J. H. Gibboney presented the report on corrosion of iron and steel, reviewing the work of an extensive committee that for a number of years had conducted tests throughout the country. A new sub-committee, under chairmanship of Mr. Gibboney has been established to study metal culvert pipe. At present the activities of the committee will be devoted to corrugated flexible metal, but later cast-iron culvert pipe will be studied.

The committee on corrosion of nonferrous metals and alloys reported progress, through its chairman, T. S. Fuller, General Electric Co., Schenectady, N. Y. Total, and alternate immersion and spray tests using different solutions such as sodium chloride, sulphuric acid and sodium hydroxide mixtures of varying intensities are being conducted with test specimens of aluminum, admiralty metal, copper, lead, zinc, tin, bronze and various classes of patented and proprietary alloys. Further exposure tests will be made in various sections of the country after the manner followed by the committee on iron and steel corrosion. A method of graphic representation of corrosion through the number of centimeters penetration per month has been developed by this committee.

An interesting new method for detecting pinholes in plated castings was explained in a paper by Karl Pitschner, American Chain Co., Bridgeport, Conn. Destruction of the nickel or chromium coating on plated ferrous metal objects is hastened by porosity which cannot be determined by ordinary inspection. Use of the salt spray to develop rust spots not always is successful, since the force of the spray washes away the telltale brown marks. A rather complicated method previously used, involving a coating of gelatinous material carrying salt and potassium ferricyanide in solution, is superseded by the new method known as the *ferroxyl* test devised by Mr. Pitschner.

In this method, a paper is coated with a thin film of solution of salt and potassium ferricyanide, previously mentioned, sprayed on. This surface coating is oven dried. When it is desired to test a piece of plated metal, the test paper is moistened with water, placed against the surface and pinholes make their presence known by small spots, varying in color if the defect is in the nickel or other plating alone, or if it penetrates the sub-coating of copper usually applied.

Reporting the work of the committee on zinc coating of iron and steel, progress is shown but no new specifications were submitted.

A group of three papers on corrosion and fatigue testing of metals was presented. The first of these on the effect of corrosion on the endurance limit of thin duralumin was read by R. R. Moore, U. S. air corps, McCook field, Dayton, O. The next, by D. J. McAdam, Jr., U. S. naval engineering experiment station, Annapolis, Md., covered a detailed and exhaustive study of the corrosion fatigue of nonferrous metals. Experiments conducted on nickel, nickel-copper, monel metal, copper, aluminum, aluminum-manganese and duralumin were analysed graphically. The experiments show that even slight corrosion simultaneous with fatigue may cause failure at stresses far below the ordinary endurance limit. Severe corrosion previous to fatigue lowers the resistance much less than slight corrosion simultaneous with fatigue.

The third paper, covering endur-

Gives Annual Lecture

DR. GEORGE L. CLARK, professor of applied chemistry, Massachusetts Institute of Technology, Boston, gave the second Edgar Marburg lecture, Wednesday afternoon. This lecture which was established in 1926, has for its purpose the presentation of outstanding developments in engineering materials. Edgar Marburg, after whom the lecture was named was for many years the secretary-treasurer of the society and is credited with the growth and successful accomplishments of the organization from the period of its incorporation.

The lecture covered the use of the X-rays in industry. Dr. Clark established the first laboratory devoted to the industrial application of the X-rays and for many years has worked and written about the subject.

ance of gray iron under repeated stress, by H. F. Moore and S. W. Lyon, University of Illinois, Urbana, Ill., was presented by the latter. Four casts of gray iron were tested for hardness, and resistance to tension, impact, compression and fatigue and the results reported.

A paper outlining factors affecting the wear testing of metals was presented by H. J. French, U. S. bureau of standards, Washington. The surface condition of the metal and a condition described as *filming* interfere with abbreviated tests of this property. Different types of machines, involving the principle of metal to gage or abrasive action were described. Comparison are made between laboratory and service tests of the various types of metals.

Tells How Standards Are Set

TRACING the history of the American Society for Testing Materials, J. H. Gibboney, in his presidential address Tuesday night, told of the formation of an American section of the International testing society in 1898 and the later establishment by charter of the present A.S.T.M. in April 1902. The work of the society has been conducted upon a plane of complete co-operation between producer and consumer. The early activities were based primarily upon consideration of safety and resulted in specifications for steel rails and structural steel, cement and other building and industrial materials upon which little real information had been available as to physical limits and tests.

Four distinct steps in the development of standards were shown in Mr. Gibboney's address. A method of testing first is established, next definitions as to terms and meanings, then the setting up of specifications and finally the recommendation of practises in utilizing the material, follow. A present trend toward research is evident and the president announced a nucleus of $1000 set aside for research purposes during the past year. This with the formation of a student grade of membership tends to show the broadening scope of the work of the A.S.T.M.

The annual report of the executive committee, which was presented immediately following the address of the president, amplified the former in many details. The organization now has 4220 members of which number more than 500 were registered for the French Lick convention. More than forty active committees carry on the work of the society.

Announcement was made of an International Congress for Testing Materials to be held Sept. 12-17, 1927, at Amsterdam, Holland, with the Dutch and Swiss associations acting as hosts. A special committee consisting of T. D. Lynch, chairman, Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa., P. H. Bates, bureau of standards, Washington, T. G. Delbridge, Zay Jeffries, Aluminum Co. of America, and G. W. Thompson, National Lead Co., New York was appointed to plan the American participation. A program of 18 papers to be offered by the A.S.T.M. and the participation and attendance of the authors and other members, has been announced. The remainder of the report of the executive committee, which was prepared by C. L. Warwick, secretary-treasurer, covered the financial affairs of the organization and outlined the participation with other organizations on technical work.

The committee on nomenclature and definitions announced the early publication of a glossary of the 255 standard definitions adopted and 144 additional tentative definitions, put forward. These probably will be included in forthcoming book of tentative standards.

The remainder of the evening program was devoted to papers and reports on testing methods and apparatus. O. S. Peters, bureau of standards, Washington, in a short paper showed the developments made in the electric telemeter, designed to measure and record stresses in such widely different structures as street car rails to the structural members of a rigid airship in flight.

Brass Investigated

UNDER chairmanship of G. H. Clamer, Ajax Metal Co., Philadelphia, the session on nonferrous metals and metallography was held Thursday night, closing the series of meetings relating to metal problems.

The committee on nonferrous metals and alloys, of which W. H. Bassett, American Brass Co., Waterbury, Conn. is chairman, recommended a series of tentative standards for advancement to standard. These included tentative specifications for manganese bronze ingots, for sand casting, phosphor tin, phosphor copper, manganese bronze for sand castings, and silicon copper. New tentative specifications were proposed for yellow brass sand castings, and for bronze castings for locomotive bearings. Tentative methods for making chemical analyses of aluminum and light aluminum alloys were proposed.

The proposed tentative specifications for yellow brass sand castings provide for the following analysis:

	PERCENTAGE		
	Desired	Minimum	Maximum
Copper	63.5	62.0	67.0
Tin	none	none	1.0
Lead	2.5	1.5	3.5
Zinc	34.0	remainder	remainder
Iron	none	.....	0.75
Nickel	none	.....	0.25
Phosphorus	none	.....	0.03
Aluminum	none	.....	0.3
Sulphur	none	.....	0.05
Antimony	none	.....	0.15
Total other impurities	none	.....	0.15

Where desired by the purchaser and provided in the purchase order a minimum tensile strength of 20,000 pounds with a maximum elongation of 15 per cent in 2 inches may be required. The tensile test is to be made upon a coupon cast on the casting and machined to standard dimensions set forth in the specifications. Castings which show injurious defects revealed by machining are to be replaced by the manufacturer, without charge to the purchaser, but the full weight of the original material is to be returned to the foundry.

Deals with Light Alloys

The British Aluminum Co., Ltd., 165 Broadway, New York, has just published a catalog giving some of the uses of aluminum and its alloys as produced in the foundry. Precautions in mixing, melting and pouring are given as are the physical and chemical characteristics of numerous alloys. The catalog is illustrated with numerous foundry scenes.

United States Electrical Tool Co., Cincinnati, has appointed R. H. Clore, formerly with the National Carbon Co., Cleveland, as representative in the Cincinnati territory. Ralph J. Cook has been appointed special representative.

Brass Shop

Reduces Molding Losses

Competition Places Molder in Receptive Mood To Grasp Information Which, When Applied, Aids in Lowering Percentage of Defects

By R. A. Greene

HIGH foundry losses and especially molding losses not always are prevented by chemists, metallurgists, or engineers. Many foundries that maintain excellent laboratories and technical organizations encounter a loss and secure a quality of product entirely out of proportion to the technical effort expended. However, the tendency of modern manufacturing is more and more toward the combining of theory and practice. Undoubtedly many know of instances where the foundryman thought it impossible to make gray iron castings unless he had a certain kind of pig iron, looking skeptically upon the chemist's mixture from analysis. Many examples similar to this may be cited, which illustrate clearly the great benefits to be derived by combining theory and practice.

The real problem which must be considered is what to do to secure closer union or co-operation between molders, instructors, foremen, chemists, metallurgists, engineers, or any other groups interested, with the main idea of producing quality castings with a low loss.

It is not the author's intention to attempt a complete answer to this all-important problem. However, the Ohio Brass Co., Mansfield, O., has developed certain plans which in practice contribute materially to the solution of the problem. While some of the ideas are not new the manner in which they are applied may be of interest.

Perhaps the greatest difficulty in starting the program was to arouse the interest of foundry workers in the theory of their problem. As a rule, molders, are not noted as seekers after scientific truth. It was hoped, therefore, to develop in them a bit of the engineer's spirit, inciting them to study the why and wherefore of their losses more carefully.

In seeking a solution to this problem the baseball plan of organization was followed. It was thought that if the earnestness, head work, and team work as prevail in baseball could be duplicated in a foundry, real results would be possible. How are these things promoted in a ball team? It was decided that they were the result of accurate records, publicity, and friendly rivalry. Upon these it was decided to build the system.

For some time the molders at the Ohio Brass Co. have been paid for the number of molds they make, less the castings that are dirty or shifted. Hence, it is necessary to keep each molder's castings separate from the time they are made until they are passed by the inspector. To secure an accurate record of all bad castings, it remained only to elaborate this system somewhat and provide forms on which the inspector's findings could be recorded.

Build on Team Work

SPECIAL features stressed in the system for reducing losses employed by the Ohio Brass Co., Mansfield, O., were obtained from a study of baseball. It was decided that the team work found in the national game is due to friendly rivalry, publicity and accurate records and these factors were included in developing the organization. The results that have been obtained with the system are described in this article which is abstracted from a paper presented at the Chicago meeting of the American Foundrymen's association. The author is assistant manufacturing superintendent of the Ohio Brass Co.

Keep Accurate Records

An accurate count of production is obtained as follows: In the brass foundry each molder's floor is poured off about eight times a day. However, the castings are not gathered as soon as they are shaken out, but are piled at the side of the molder's floor where they remain until the end of the day. At the end of the day's run, the castings are counted carefully by the instructor. The molder's count, which he keeps to check his pay, must agree with the instructor's count before the castings are moved. In the beginning, some difficulty was encountered in getting these to check, but after a few week's operation, the discrepancies practically disappeared.

In the brass casting department, which is the first stopping point, the cores and sprues are removed, the castings are sandblasted, rough ground, and sorted. Castings from each pattern are put into suitable containers. Attached to each container is the original record showing the molder's clock number, the pattern number, and the number of castings as filled out in the beginning by the foundry production department and checked by the instructor.

The containers are delivered to the inspector who separates them into good and bad, and the bad he further divides into dirt, shift, misrun, core trouble, spoiled and short. Short shows that the good and bad together do not equal the total called for on the instructor's ticket.

Shortage originally was one of the big losses. However, this fact was not realized until brought to light by present methods of keeping records. Shortage is caused by miscount, the error having slipped by in some manner. It may be, and frequently is, caused by spoiled castings—that is, castings spoiled where they are cut from the sprues, and which the sprue cutter has failed to turn in. When the man cutting sprues spoiled a casting in this manner it was found that he would throw the spoiled casting into the scrap, partly because he thought it was useless to put it in with the good castings and partly to hide his carelessness.

When several things of this nature had been brought to light the importance of having the various items checked was obvious. It should not be inferred that an absolute banker's count is necessary, but rather a check that will give some predetermined degree of accuracy. For example in weight counting, the scales are checked

occasionally by actual count and the percentage variation was noted and recorded or remembered.

Another reason developed for careful checking. At one time the foundry had a pattern which a majority of the molders found exceptionally difficult to make. The company thought that this pattern was wrong and should be changed, but we hesitated because one molder seemed to be successful with the pattern as it was. This continued for some time. Finally, this man was caught in the act of secretly disposing of the defective castings that would be deducted from his pay. This was accomplished before the castings left his floor. At the time, to avoid the trouble of counting the castings, the inspector would simply deduct the bad castings from the original count. The difference was the good castings for which the molder was paid. This example went a long way in helping to get things systematized.

Of course, everyone dislikes the trouble, bother, and expense incurred in installing and operating any kind of system, although all agree or half agree that it is necessary. Stopping a few molders from doing things similar to that described would justify and more than pay for an accurate count.

It has been the author's experience that as soon as a worker discovers that his efforts are not accurately recorded, and he is quick to sense this, he makes less effort, until finally the quality of his production is below what is desired. He tries to use good judgment, but, as a rule, unless he is a mechanic with an intelligence above his present position, his judgment often is erroneous.

The inspector now turns his findings in to the inspection department's clerk and the clerk posts the information on the sheets, as shown in Fig. 1. One of these sheets is provided for each instructor's group daily. It not only shows each molder's record, but also the group's or the instructor's record for the day. Care is taken to keep the same rotation of the molder's numbers, so that by putting the sheets together a molder's record may be seen easily. The sheets are so arranged on the bulletin board that each molder's total loss, molding loss, and foundry loss is shown for each day of the week. Monday's sheet is shown first. When Tuesday's sheet is displayed it is put on top and covers Monday's with the exception of the last three columns.

When these sheets are displayed, the daily total loss and daily molding loss of each group is plotted on a quarterly graphic record. At the end of the week, or at the time that Monday's sheet of the next week is ready, the record of the combined loss of each group is blocked in, either with blue or red. At this time, the finished week's daily sheets are removed and the new week started.

The records, forms, and charts were arranged with the idea of attracting attention. Blue and red figures were used, blue for loss less than 5 per cent, and red for a loss above 5 per cent. The bulletin board is an elaborate affair—made so purposely. Heads and men of other departments are asked to give the posted records at least a glance as often as possible. An attempt was made to imitate the baseball score, with the idea that the more spectators the greater the enthusiasm, and the greater the enthusiasm the keener the competition.

Other things of a more personal nature were tried. When the supervisor of this work posted the daily sheets, he endeavored to get the instructors to gather around the bulletin board to view their latest record. However, this required no effort. Not only the instructors, but also the molders, whenever it was possible for them to do so, were anxious to see their records. The interest shown by the molder was encouraging because any time lost by him in looking at the exhibit means money lost, unless he can profit by what is shown. As the molders continue this practice, it proves that they must get some benefit.

The supervisor's opportunity to hear about the instructor's troubles at this time is obvious. Many statements and criticisms are made and arguments are started that can readily be used to advantage by a supervisor, who is trying to reduce the loss.

For example, the supervisor will make some remark to the instructor about one of his molders who has been running a certain pattern with what looks like an excessive loss. The instructor will admit that the loss is excessive, that he has tried several things without success, that the foreman has made some suggestions that have been tried but were not successful, and the loss still continues. The supervisor looks at the job, thinks about it, talks about it, brings it to the attention of the foundry superintendent, to the metallurgists, to the chemists, and in many cases to the manufacturing superintendent, the main idea being to get as much attention as possible focused on any job running with a loss higher than the average.

A molder is running with an excessive loss, the cause of which, upon investigation, is found to be defective cores. When the instructor's attention is called to this, his excuse is that the cores are supposed to be inspected by the core department and come to him perfect. He is told that while his remarks may be true, nevertheless that does not relieve him entirely of the responsibility. A mere glance at the box should tell a man of his experience whether they looked good or bad, and if they looked bad he should investigate further. He also is told that he should teach his molder something about good and bad cores. Some one of the instructors will think about remarks such as this and will make a reduction in the loss. This reduction is pointed out and commented upon.

Another good illustration is the spoiled casting loss. This loss is made in removing the sprues, either by the

FORM 261 21

BRASS FOUNDRY—DAILY LOSS

Instructor Hartman For March 12 192 Saturday

MOLDER	PATTERN	MADE	GOOD	BAD	FOUNDRY: MOLDING DIRT	SHIFT	MR	GOOD	BGS	SHORT	TOTALS: MADE	BAD	MOLDING	FOUNDRY
1103	14449		617	69	6	63						100	100	0.0
											686	69	69	—
1108	1630		136	8	8							49	49	0.0
											164	8	8	—
1112	14047		192	24			23		1			11.1	0.0	11.1
											216	24	—	24
1150	14474		958	22	3	15	4					2.2	1.8	0.4
											980	22	18	4
1158	14454		33	8	4		4					196	9.8	9.8
											41	8	4	4
1164	14427	104	103	1		1			1			1.1	0.7	0.4
	12331	170	168	2	1						274	3	2	.1
Totals	Number	5227	4997	230	80	79	67		4		5227	230	159	71
	Per Cent				1.5	1.5	1.3		0.1			4.3	3.0	1.3

A DAILY RECORD OF THE WORK PERFORMED UNDER EACH INSTRUCTOR IS POSTED ON THE BULLETIN BOARD

sprue cutter or by the grinder, and formerly was not shown on the instructor's sheet. However, this loss increases the scrap, and it was thought that if the help of the instructor could be enlisted another source to attract attention would be brought to bear on the men who were responsible for this loss. It also made another division in the record over which, with proper handling, competition could be aroused between instructors. Another chart was designed for the sprue cutters. Castings spoiled in removing the sprues were recorded daily on this chart. This procedure reduced the spoiled casting loss from about 1300 castings to less than one hundred a week.

Shortage was another division of the loss to which little attention had been paid. Shortage was caused by carelessness in counting. In weight counting it was caused by not having the scales checked occasionally. The castings spoiled by the sprue cutter would be thrown in the scrap. The help of the instructor was enlisted to eliminate this trouble.

To enlist the interest of the instructor in all this work not only was his sportsmanship aroused by the display of his records, but he was put on a bonus. This bonus was arranged so that it did not function unless the weekly group loss was below ten per cent. It was thought that this plan would be an incentive, although it has not come up to expectations. Some of the instructors have asked to have the bonus taken off, preferring to be on a weekly salary. This was granted in several cases, with a result that was even better than the bonus scheme, which tends to prove that after all the greatest spur is pride in achievement.

The third idea, that of inciting rivalry or competition, was perhaps the major idea in mind in the arrangement of the whole system. It was thought that if competition in reducing loss could be aroused between the molders and between the instructors, and also if a molder or an instructor or the foundry as a whole could be incited to excel previous records, commendable results could be accomplished.

If an instructor has a molder who is having trouble with dirty or misrun castings, he, of course, consults his foreman, but he is encouraged to seek information from the technical department. It is thought the more theory that can be mixed with practice the better the results will be.

To encourage this close relation with the technical department, groups of instructors and molders have been taken into the laboratory and have discussed methods used in controlling the metal, the cores, and the sand. The pyrometers were explained to them. They were shown how to measure the bond, the permeability, and the moisture content of molding sand. The relation of these properties to casting losses was discussed. This has helped the instructors and molders to understand their problems better and resulted in better co-operation.

The results of this scheme, which was started the latter part of 1923 are commendable. The loss for 1923 and previous years was around 8½ per cent, which represented approximately 400,000 pounds of bad castings. For the years of 1924, 1925 and 1926 the loss has averaged between 4 and 4½ per cent, making a saving of approximately 200,000 pounds of castings a year for the last three years.

Readers Comment

Note—Material appearing under this head does not necessarily reflect the opinion of THE FOUNDRY or of its editors.

Commands Many Proofs

To THE EDITOR:

In your excellent report of the recent American Foundrymen's convention, you have quoted me incorrectly as using the word *wrong* in the discussion on pig iron on page 462 of the June 15 issue. This was not the word I used in characterizing the present day blast furnace product. I referred to it with some emphasis as *raw*, implying that it was cooked only partly or improperly smelted. Since giving utterance to the above, I have had many arguments and much correspondence concerning it. All agree that there is something wrong with our pig iron that causes in finished castings those mystifying blemishes I spoke of, but invariably the matter closes with the assertion that I cannot prove it.

I have many proofs at my command, circumstantial of course, but nevertheless positive and convincing. Clear circumstantial evidence always was, is now and always will be a principle and leading factor in conviction. I would be the last one to condemn, or in any manner hinder the increase of production or the lowering of costs. I have spent the best part of my lifetime doing such things, but every time either I or any other foundryman increases production and lower costs the same or better quality must be shown, and we see no reason why the pig iron producer should be an exception to this rule.

We are all familiar with the phenomenon of metal at the blast furnace throwing off free graphite or carbon when it has more of that element than it can hold in solution. We are not so familiar with another prenomenon that happens under similar circumstances, when the furnace is not operating well. Instead of expelling free carbon, the bath expels rouge or ore dust. If this alone does not prove the existence of free oxides in the metal then, from my point of view, the industry is in a bad way.

Very truly yours
JAMES A. MURPHY.

HAMILTON, O.

Anticipated Shrinkage in Light Castings

Question: We are making sole plates for electric irons about ¾-inch thick and although we use a soft northern iron the castings show a shrinkage of about 1/64-inch in the center top and bottom. We add 2½ per cent steel to the charge in the furnace and then place a sufficient amount of steel in the spout to bring the total steel addition up to about 6 per cent. Do you know of any alloy which we might place in the spout or the ladle to prevent this shrinkage? We have tried shrink bobs and different methods of gating without success.

Answer: The fact that the shrinkage appears on both top and bottom inclines us to the opinion that the fault lies in the pattern or in the mold and not in the metal. We suggest you check up carefully on the pattern and on every step in the formation of the mold. You may be surprised to find that things are not at all what they seem. If you find every thing in perfect condition, then the simplest remedy for your trouble is to increase the thickness of your pattern 1/64-inch in the center and thus anticipate the shrinkage.

Describes Conveyors

Mathews Conveyor Co., Ellwood City, Pa., recently has published a 20-page booklet showing various applications of its conveyors in gray iron, steel and nonferrous foundries. The booklet is well-illustrated and descriptions of various features of construction of the conveyors are presented.

John J. Harris Inc., Philadelphia, miners and distributors of foundry sands, supplies and equipment, has removed its office to room 507, Fox building, Sixteenth and Market streets.

How and Why in Brass Founding

By Charles Vickers

Oxidized Skin Forms

We are sending you a sample cut from an 1¼-inch brass stick which we cast horizontally, and which you will note is solid except the top which appears to be spongy. This metal was all scrap crown brasses supposed to contain 80 per cent copper; 10 per cent tin and 10 per cent lead. We melted in a crucible furnace using coke for fuel and charcoal and salt for a cover. When we poured this metal into larger sticks of 2½-inch diameter and upwards, we poured them perpendicularly and found shrinkage. We used as large a riser as was consistent with the size stick we were making. Can you give us any light on the cause of this sponginess and shrinkage? For your guidance we also are sending you the top end of one of the 2½-inch sticks. You will note also, on the smaller stick the sand cut away at the gate. How can we overcome this? We are using Albany sand.

In the Sept. 1, 1922 issue of FOUNDRY, pages 958-960 there was an article on the casting of red brass sticks; we suggest this be carefully studied.

The sponginess mentioned is quite different to what is usually visualized when the word is applied to castings. It appears to be nothing but the oxidized skin that forms on metal poured at too low a temperature and which washes along with the stream and is then crushed by the hydrostatic pressure against the cope surface of the casting. This can be remedied by pouring with hotter metal. As far as the alloy itself is concerned the fractured surfaces are perfectly sound, showing metal of good grade. The cutting of the side of the mold at the gate end usually is associated with hot metal, but we do not believe it was poured hot enough, otherwise the oxidized films would not be present against the skin of the casting. It looks as though something was greatly wrong with the molding. The sand if No. 3 grade ought to give clean, sound castings. Therefore, the sand has been worked too dry, or the mold was too soft rammed. These matters will have to be decided right in the shop, and if this diagnosis is wrong, the sand has been used for cast iron and is worn out and contaminated with iron rust. We advise new sand be liberally added to the piles. These 1¼-inch diameter sticks should not shrink, even when poured from one sprue when six or more are in one flask. Naturally a heavy sprue has to be used, and the runner across the ends of the sticks must be heavy and higher in the cope than the tops of the castings. The sticks can be made to come clean by running the metal uphill through the bars, and then into a riser, but this is not generally necessary.

The same oxidized films of metal show also on the 2½-inch diameter stick. If it is found desirable to cast these sticks vertically the pattern should be "drawn" which will give a longer stick. The excess which is the sullage head, has to be cut off. They can be gated near the bottom. About 0.25 per cent phosphor-copper would not be at all harmful to the metal. These 2½-inch sticks also can be cast horizontally. Give them a 6-inch cope; put a 3-inch diameter riser at the end of each bar and cut a gate nearly as large as the end of the bar. Pour through a small separate sprue, and break off the risers while the castings are hot enough.

Makes Pattern Letters

We are making bronze tablets our specialty and as we will require numbers of metal pattern letters, we will appreciate your advice regarding a suitable mixture therefor.

Pattern letters are cast easily. Some cast them in semi-permanent molds. Such molds can be made of bronze, poured vertically and held together by clamps. The blank side sometimes is formed of wood, but the back of the mold should be made of bronze also. However, a rapid method of making pattern letters is to have a *board* with holes to correspond to the pins of the flasks, and this is placed between the cope and the drag of a flask. The drag is rammed, the flask rolled over and the cope rammed, lifted off and the mold finished.

As to the sand, get fine sand. Fix a special *tub* on which letters are to be molded, and equip the tub, not with molding sand, but with "silica flour" such as that used by steel molders as a *wash* for their molds. Use it as one would a molding sand, and do not have it any more damp than will hold the sand together. This is only good for white metal, a good mixture being: Lead, 80 per cent; tin, 10 per cent; antimony, 10 per cent.

Inclusions Spoil Work

We experience difficulty due to oxide and dirt inclusions when making manganese bronze rollers 9 inches long and 6½ inches diameter, with a cored hole 1¼ diameter. We mold these on end, gate at the bottom and put a large feeder on top, just beside the core print. We melt in coke-fired, crucible furnaces, using no flux, but a charcoal cover. We pour at 1900 degrees Fahr. What is wrong?

The method of gating is wrong as the metal rushes into the mold from several streams which impinge against each other, also billow up against the core, producing dross which clings to the mold surface as the metal rises. The correct method of gating can be found easily if it is considered that such an alloy as manganese bronze resembles soapy water, when it is in the liquid condition. Whenever the liquid bronze foams it makes the dross complained about. All that is required is to so enter the metal into the mold cavity that it flows evenly and so forms no lather.

In connection with figuring a gating system that permits the metal to enter the mold minus all agitation, there is the question of the mold itself. It is evident that all efforts to enter the bronze quietly into the mold will be nullified, if the walls of the mold are too damp, too hard rammed, or if the sand is too close, because even though the metal enters quietly, it will not remain quiet due to agitation caused by the mold. Both manganese and aluminum bronze are temperamental alloys to flow into a mold, and get clean, sound castings. It is all due to the saponifying effort of aluminum. The only flux to use is common, ordinary salt. The pouring temperature may be too high, but it is difficulty to say whether it is or not. Pour when the metal flares a little when the surface is disturbed by the skimmer, then see what temperature your pyrometer registers and pour at that temperature. The temperature for each type of casting should be determined individually.

JOHN D. CAPRON, research engineer for the United States Cast Iron Pipe & Foundry Co., Burlington, N. J., entered the metal-working industries immediately after completion of his course in mechanical engineering at Sheffield Scientific School, Yale university, New Haven, Conn. He took a year of graduate work at Yale, and in 1915 joined the United States company. Except for a short time, during his connection with the air service of the army, Mr. Capron has been affiliated with his present company. He has been identified there with engineering, publicity and sales departments and in the past few years has been devoting his time to development work, acting as research engineer. Mr. Capron is a member of the Cast Iron Pipe publicity bureau, the American Foundrymen's association and the American Standardization committee on soil corrosion.

Reviews Progress *in Centrifugal* Casting Processes

By John D. Capron

OVER a hundred years ago, in 1809, Anthony G. Eckhart of England patented a method of casting by centrifugal force to "render the cast more perfect and neat." Eckhart's patents covered the casting of hollow bodies of various shapes and his illustrations show molds rotating around vertical, horizontal and inclined axes. A combination of rotation around two axes was used to form spherical bodies. Although his patents were correct in theory, very little information was given as to the method of rotating the molds and insofar as is now known, his invention was never used.

An American, Thomas G. Lovegrove of Baltimore, is credited with the next step in the development of centrifugal casting. His patents, taken out in 1848, cover a crude apparatus for rotating a two part mold and offer the first information as to how rotation of a mold was actually accomplished.

The year 1859 was one of remarkable advance in the art of centrifugal casting. It was at this time that Sir Henry Bessemer perfected a method for casting bars, plates and rods of malleable iron or steel from which the gases had been removed by centrifugal force. M. Tresca, in a discussion before the Institution of Mechanical Engineers in 1867, refers to rails manufactured at the Imphy Iron Works by this method as "remarkably free from blow holes." Some years later the Commentry Fourchambault Co. tried casting ingots for rail rolling in molds placed about a center axis like spokes of a wheel. For short ingots this method gave good results which, unfortunately, were not duplicated with larger ingots.

No discussion of centrifugal casting would be complete without considering the work of Joseph Whitley of Leeds, England, whose patents cover the period between 1860 and 1885. Working alone, or in conjunction with other engineers, he perfected many ideas which, although they have not in themselves been commercially successful, have aided other inventors in solving their problems and have been studied in connection with many of the more recent inventions. It has been said of Whitley that he had a "keen appreciation of the controlling influences . . . of centrifugal castings."

One of his early patents, taken out in conjunction with Bower, covers a machine for casting iron wheel tires. The patent refers to a mold coated with clay into which iron was poured or a pasty wrought iron bloom was forced. The force of rotation causes the metal to assume the form of the mold. It is evident that the process was not always successful as the patent provides that, if the result was not satisfactory, the tire "could be reheated and rolled, hammered or pressed to size."

Many of his patents covered methods of distributing the molten metal in the mold. The first investigation of this type was made with Sampson Fox and resulted in a bottom pour ladle mounted on wheels so that it could be run into the mold. Holes were placed at regular intervals along the bottom so that the iron was delivered in a number of streams so as to prevent cold laps and uneven thickness. An interesting development of this pouring ladle consists of a trough designed with a series of spouts at regular 6-inch intervals throughout its length. As this trough is tipped, iron is fed into the mold at several points. This pouring device has a reciprocating motion of 3 inches so that during pouring the metal is fed in with a weaving motion giving the effect of a woven fabric. This patent also covered the introduction of compressed air into the mold to neutral-

ize "the vacuum caused by the great heat in the respective molds." This vacuum, they claimed, resulted in iron with "drawn and blown holes."

The next important patent was taken out by Whitley, working independently. He suggested the use of a heat resisting packing as a mold lining to conserve the heat in the casting and give greater density and tensile strength. Several subsequent patents apply to this idea but apparently Whitley was not successful in departing from the permanent molds in use at that time. This inventor also suggested the idea of weighing the metal before pouring to control the thickness of the casting, as well as a method of removing the casting from the mold by means of a screw.

Chalmers Had Advanced Ideas

One of the most interesting of the early inventions was that of Chalmers in 1867. He proposed to place pipe molds radially like the spokes of a wheel. In addition to the rotation of the molds around the central hub each individual mold rotated about its own axis. It was expected that this combined rotation would eliminate the need of cores. There is no record that this method was successful but the idea of similar molds mounted on opposite sides of an axis is used today to form intricate castings.

Thompson made use of his patent, dated 1873, to produce lead sheets by the centrifugal method. A cylindrical mold rotating horizontally was used, and, after the molten lead had set in the form of a cylinder, it was cut longitudinally and flattened out. Reference has been made to the uniformity in thickness and freedom from defects of sheets cast in this way. Almost the same year, C. W. Torr combined the researches of other inventors and patented a process for casting tubes in a rotating horizontal mold. His machine was designed for casting long pipes of nonferrous metals.

Years of investigation were beginning to bring results and in the Journal of the Iron and Steel Institute for 1882 we find a reference by F. W. Webb of Crewe to locomotive drive wheels cast by centrifugal force. The writer referred to the "sound clean wheels" which resulted from this method of casting. Today it seems remarkable that the results were satisfactory as the rotation was held down to 40 or 50 revolutions per minute.

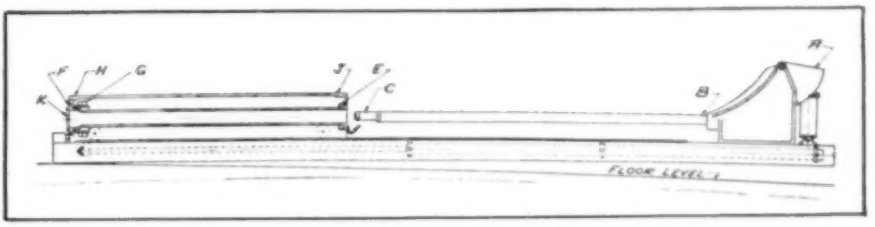
The problem of introducing the molten metal into the horizontal mold without splashing has been given much attention by engineers. In 1891, Lane suggested that the iron be introduced into the mold in a narrow stream to which had been imparted a rotary motion. As the mold is being poured it is gradually withdrawn so that the metal is deposited continuously over the entire surface of the mold.

Centrifugal force was utilized commercially late in the Nineteenth Century to eliminate blow holes in steel ingots for rolling. Credit for the development of this process is due to J. L. Sebenius of the Nykroppa Steel Works, Sweden. The process was simple. Two molds were suspended on a yoke and on opposite sides of the hub. These were filled with steel and the machine rotated. Centrifugal force caused the swinging molds to assume a horizontal position and at the same time forced the impurities and gases out of the steel. Several installations were made in the various plants of the company mentioned and they were operated for a number of years. Unfortunately, the method was not adaptable for use with large ingots and since the death of the inventor the method has been abandoned.

Many great engineers have tried to solve the difficulties of centrifugal casting and in 1895 we add the name of Sir Hiram Maxim to the list. The plan of this inventor was to make pipes in a continuous length by centrifugal force. Metal was fed into a rotating mold tapered towards the feeding end so that the liquid metal pressed the molded pipe forward in front of it. At the end of the mold the pipe was cooled by a water jacket and was solidified sufficiently to pull out onto rollers.

The nineteenth century closed with most of the elemental research on centrifugal casting completed. However, there were many minor problems as yet unsolved and a review of the first six months of 1900 discloses five patents granted on centrifugal casting machines. Among these patents is a horizontal casting machine invented by Ferdinand Deming of Waterbury, Conn. This machine is equipped with pistons, one of which blocks off the mold until the proper time when the molten metal is admitted as a body. The other piston serves to remove the ingot after pouring.

The first centrifugal process to be used for the commercial production of heavy ferrous castings on a large scale was invented by Demitri Sensaud deLavaud. Convinced that many of the difficulties of centrifugal casting were due to the molds used by the early inventors, deLavaud started in 1914 a series of experiments on casting pipe in permanent rotary molds. Heated molds were first used without success, as it was impossible to withdraw the pipe for at least three minutes after pouring.



THE DE LAVAUD MACHINE FOR CASTING PIPE CENTRIFUGALLY

After experimenting with molds heated to various temperatures, it was decided to try a cold mold. The inventor had to pour the pipe himself as his foundrymen were afraid of the action of the hot metal on the cold mold. The first pipe cast in this way was satisfactory and could be withdrawn in a few seconds after pouring. No provision for cooling the mold had been made and as operation continued and the mold gradually heated it became increasingly difficult to withdraw the pipe, indicating that hot molds caused the earlier troubles. As a result of these experiments, principles were developed which have since been followed in the commercial production of centrifugal castings.

After devoting two years to further development of this process, deLavaud had a machine built in Buffalo with a view to introducing the process into the United States. He was not immediately successful in convincing foundrymen in this country that their problems were solved, but in 1917 the National Iron Works, Ltd., of Toronto, took over the rights of Canada. Commercial production was started almost immediately in their foundries and the plant has operated continuously up to the present time. Shortly after this the Centrifugal Cast Iron Pipe Co. and the International deLavaud Mfg. Corp. Ltd., were organized to

control the development of this process.

In 1921 the United States Cast Iron Pipe & Foundry Co. obtained the rights for the deLavaud process for making pipe in this country and experimental work was immediately started at their Burlington works, Burlington, N. J. The development of the process on a commercial basis proceeded rapidly and early in the next year construction of a battery of four machines was started at their Birmingham plant. This plant was put in commercial operation in the fall of 1922 and the process proved so successful that the battery was duplicated shortly after that time. Since then a second plant has been built at Burlington. This plant now comprises nine machines which is actually half the expected ultimate capacity.

The deLavaud process is shown in the accompanying illustration. Each unit consists of four parts. At one end of the machine is a pouring basin or tilting ladle (*A*) designed to feed the iron into the mold at predetermined and constant rate. From the pouring basin the iron is conveyed into the mold by means of a spout (*BC*) long enough to reach to the extreme end of the mold. The end of the spout (*C*) is turned at an angle so that the molten iron flows into the mold in the plane of rotation. The entire machine is set at a slight angle with the horizontal so as to cause the iron to flow down the spout. This angle is too slight, however, for the action of gravity to effect the distribution of the iron once it is in the rotating mold.

The mold (*EF*) itself is of steel and its inner surface is just the contour of the outside of the pipe. A motor or a water wheel (*G*) serves to rotate the mold in its casing (*HJ*). The annular space between the mold and the casing is filled with the cooling medium which keeps the mold at a constant temperature. In addition to the rotation of the mold, the mold and casing have a horizontal traverse slightly greater than the length of the pipe. This permits the distribution of the iron in the mold.

In actual operation the end of the mold away from the pouring basin is first blocked off with a stop plate (*K*). On this plate is the core for forming the lead space in the bell of the pipe. This is the only core in the operation and is needed to form the enlarged interior diameter of the pipe at this point; for pipe having a uniform inside diameter such as plain end pipe or flange pipe no core is necessary in the process.

After this step the pouring basin is charged with enough iron to form one pipe. The mold is then advanced until the spout extends nearly through the mold so that the iron flowing out of the end of the spout will enter the bell cavity. With the mold rotating at a speed of approximately 600 revolutions per minute, for a 6-inch pipe, pouring is started. As stated above, the iron flows as nearly as possible into the plane of the rotating mold and centrifugal force holds it against the inner surface of the mold. As soon as the molten iron fills the bell cavity the horizontal travel of the mold is again started; this time, however, it travels away from the pouring basin. In this way iron is fed into each part successively and the pipe is built up throughout its length. The surface of deLavaud pipe shows some evidence of the spiral ribbon of metal from which it is built up, but so rapid is the pouring that there is no evidence of segregations in the metal itself.

Operation Is Rapid

At the end of the horizontal travel of the mold, the spout is beyond the end of the pipe and any excess metal flows into a pig basin at the side of the machine from which it is later reclaimed. The entire pouring operation takes only a few seconds and the pipe may be immediately withdrawn. This is accomplished by placing tongs in the bell end of the pipe and again advancing the mold allowing the pipe to roll out on skids.

The short time the pipe is in the cool mold produces only a surface chill and minor casting strains which are removed by placing the pipe in an annealing oven. After bringing the pipe well up toward its critical temperature it is allowed to cool slowly as it rolls through the oven. The idea of annealing cast iron pipe is not a new one and pipe cast by the older methods were required by specifications to be allowed to "soak" in the mold until they had lost the "color of heat."

The deLavaud process was developed essentially to give a method of economically casting pipe of uniform section. However, the force under which deLavaud pipes are cast, as well as the action of the cold mold and subsequent annealing, improves the physical properties and microstructure of the iron to a marked degree.

It has been stated that "the high tensile strength of the deLavaud pipe is undoubtedly due to this unusual combination and arrangement of structural elements." The reduction in the size of graphite flakes is obvious in microphotographs. In this connection it is well to recall Professor Sauveur's statement regarding the effect of graphite on strength: "There is no doubt but that, other things being equal, the finer and less angular and sharp the graphite particles, the stronger must be the iron."

The iron used in the process is the same as that used in making sand cast pipe. Test bars were poured from this iron before it entered the centrifugal machine. An average of nine bars, each 2-inch by 1-inch in section, placed flat and supported on 24-inch centers loaded at the middle supported a load of 2087 pounds with a deflection of 0.36-inch.

After being cast into pipe by the deLavaud method, transverse test bars were cut from the walls. These bars were ¼-inch by ½-inch in section and were supported on 11½-inch centers. Each of the bars tested failed between 225 and 250 pounds load. An increase of strength of 65 per cent, as shown by the bending moment of 37,000 pounds per square inch for the first bars and of 62,000 pounds per square inch for the bars after centrifugal casting. Tensile bars cut from these test sections show similar results. The untreated iron had an average tensile strength of 20,242 pounds per square inch compared with 35,658 pounds per square inch for bars cut from the completed pipe.

In considering these tests it should be borne in mind that the strongest part of the deLavaud metal, i.e., the outer layer, has been removed by machining. For this reason actual bursting tests on the deLavaud pipe are far more indicative of its true strength. Full 12-foot lengths of pipe were tested. The bell end was threaded and a threaded cap was screwed in place; the spigot end was closed by means of a stuffing box held in place in the regular foundry test press. This type of testing apparatus limits the stresses in the pipe to those imposed by the internal test pressure.

STRENGTH OF PIPE

	Average Min. wall inches	Av. bursting pressure lbs. per sq. in.	Av. tensile strength lbs. per sq. in.
6" Sand cast pipe	0.50	2475	14,600
6" deLavaud pipe	0.39	3730	29,200

As a result of an independent investigation, Professor Gillespie of Toronto university summarized the change in physical properties resulting from the deLavaud process by stating "the strength in tension and cross-bending, the resistance to shock and the stiffness are about twice as

great for machine made iron as for the sand cast product."

As long ago as 1840, Robert Mallet in "An Extensive Study of the Corrosion of Metals" made for the British Society of civil engineers stated that of two metals having approximately the same chemical composition the denser would resist corrosion to a greater extent. That the finer grain of deLavaud pipe is corrosion resisting has been brought out by the soil corrosion tests now being conducted by the National bureau of standards. This is probably due to some extent to the uniformity of deLavaud metal and its freedom from impurities. It is estimated that the force available for the elimination of gas and impurities is 32 times as great for a 6-inch pipe cast centrifugally as for the same pipe made by the old sand cast method.

DeLavaud pipe fulfills the expectations of the inventor in that it is remarkably uniform in thickness. Variation of thicknesses average under 0.02-inch throughout the circumference. When we consider that sand cast pipe often varies as much as 0.12-inch circumferentially the accuracy of deLavaud pipe becomes more remarkable.

Process Is Economical

DeLavaud's hope for economy has also been fulfilled and pipe cast by his method is sold at a lower cost per foot than the heavier sand cast pipe. This saving has been made possible, however, by numerous improvements in the details of the process itself. In 1919, the plant at Toronto was turning out 15 pipes in an hour; today the regular output is more than double this figure for 6-inch pipe. Obviously, the process is no longer in the experimental stage and there are now many thousand miles of deLavaud pipe in sizes from 4-inch to 20-inch giving satisfactory service here and abroad.

At present there are eight companies operating under the deLavaud patents for making cast iron pipe:

The United States Cast Iron Pipe & Foundry Co.—Plants at Birmingham, Ala., and Burlington, N. J.

The National Cast Iron Pipe Co. (Sub-licensees of the above company) —Plant at Birmingham, Ala.

The Stanton Iron Works Co. Ltd.—Plant at Stanton, Eng.

Tsuda & Co.—Plant at Osaka, Japan.

The National Iron Corp. Ltd.—Plant at Toronto, Can.

Compagnie Generale des Conduites d'Eau—Plant at Liege, Belgium.

Hoskins Iron & Steel Co. Ltd.—Plants at Sidney and Lithgow, Australia.

Gelsenkirchener Bergwerke—Plant at Gelsenkirchen, Germany.

Recently there has been developed a method of casting pipe by centrifugal force known as the sand-spun or mono-cast process. This differs in several essentials from the deLavaud process. An individual sand-lined mold is used for each pipe and the iron is introduced while the mold is warm, the full charge of molten metal to form the pipe being poured into the tilted mold. The mold is then rotated and as the desired speed for casting is approached the mold gradually assumes a horizontal position. This process is now being used commercially by R. D. Wood Co., Florence, N. J., and the American Cast Iron Pipe Co., Birmingham, Ala.

The Hurst-Ball system of centrifugal casting is now in use in the foundries of Centrifugal Castings, Ltd., Kilmarnock, Scotland. Originally the use of this system was limited to short cylinders of rather large diameters such as piston rings, engine cylinder liners, wheels and roll castings from 10 inches to 30 inches in diameter and up to 36 inches in length. The process makes use of hot steel molds kept up to the required temperature by turning out the castings in rapid succession. It was impractical for use in making long tubes of small diameters as contraction on cooling such tubes was so slight that they must be allowed to cool quite materially before being withdrawn. Through the development of a pouring spout, somewhat similar to that of Whitley, cast iron pipe 36 inches in diameter and 12 feet long have been produced. This device consists of a tilting pouring spout equipped with a helical wire edge approximately the length of the casting to be produced. The iron is fed into the mold by partially tilting the spout which feeds the iron continuously, starting at one end of the pipe and ending at the other.

One of the most recent of the various methods of casting pipe centrifugally is the Henry-Weitling-Peake process. In this method the mold is kept at the correct temperature by circulating hot mercury vapor under pressure around the mold. The patent includes provisions for retaining the mercury which may be used continuously. Another patent controlled by this company covers the use of permanent bell cores of gas carbon as well as the use of carbonaceous linings of the mold.

For a number of years Stokes Castings, Ltd., of Mansfield, Eng., has been making castings centrifugally and its work has been taken over recently by the Sheepsbridge Stokes Centrifugal Castings Co. Ltd. The Stokes process makes use of permanent molds heated from the castings. Various types of rings and cylinder linings are made by this process.

Used For Piston Rings

Centrifugal casting is the ideal method for casting piston rings and in addition to this application of the Stokes and the Hurst-Ball systems there are several others in use. The interest that manufacturers take in this seemingly small product may be realized when we consider that the Ford interests alone use 16,000,000 rings each year. One foundry makes use of the deLavaud process for casting rings with only slight modifications from the method described for casting pipe.

In direct contrast with the method of casting rings in cold metal molds is that used by the Wasson Piston Ring Co., Plainfield, N. J. The rings made by the Wasson method are surrounded on three sides by sand during casting. In addition, the rotation is vertical, the iron being poured into the center of a dry sand mold representing four rings connected by gates. Piston rings in almost all sizes are now being made by this method. The British Piston Ring Co., Ltd., Coventry, Eng., casts piston ring pots centrifugally. From these pots the individual rings are subsequently cut.

For some years, castings of odd designs have been produced centrifugally. This has been accomplished by placing molds of similar volume on opposite sides of a vertical axis and rotating them. As a result of centrifugal force the iron fills the most intricate mold and the impressions are sharply reproduced. In addition the castings are remarkably free from impurities. Experiments made on castings of this type, but of nonferrous metals, have been carried on for some time and it is hoped that the process will be developed commercially in the near future.

In his paper on "The Development of the Centrifugal Process in Great Britain" before the American Foundrymen's association late in 1926, J. E. Hurst stated that "the development of the application of the centrifugal process to the production of castings in steel has not been so extensive as in the case of cast iron." He refers to the Davis steel wheel process as the only application of importance in England. This process is used by

John Brown & Co. of Sheffield to secure a manganese steel rim on wheels.

In this country, as well as in England, most of the work on the application of centrifugal processes to use with steel has been of an experimental nature. A method of casting steel pipe in hot molds has been given much attention and one process has already been patented. The same inventor, Leon Cammen, has patented a method of casting steel ingots and plates centrifugally. His process makes use of a "bottle neck" mold to eliminate splashing.

The McConway-Torley Co. operating under the McConway patents casts disk-shaped ingots in permanent molds. The feature of this process is that the metal is placed under pressure of 500 pounds per square inch by means of a hydraulic piston as the metal sets. This, it is claimed, forces all impurities and gases through the pouring hole in the center of the mold. Steel tubes and ring-shaped ingots have been produced in this country under the Milspaugh patents. Castings of this kind were used in the exhaustive investigation of centrifugally cast steel made by George K. Burgess of the bureau of standards.

Used For Nonferrous Metals

As is the case with steel, nonferrous alloys are melted in batches and, therefore, it is difficult to have available a continuous supply of molten metal such as is desirable for centrifugal casting processes. Yet, in spite of this handicap, centrifugal processes are in use in other industries. The difficulty of producing perfect brass and bronze tubes by ordinary methods has long been recognized. Since 1918 experimental work on the development of a centrifugal method for casting such tubes has been under way.

Centrifugal force has also been used to produce aluminum and monel metal tubes, copper bands and large cast iron paper rolls. Unusual applications of centrifugal casting include the manufacture of concrete pipe, the casting of babbitt bearings and the application of wax coatings to the outside of paper rolls.

Professor Sewicki, the first authority to write exhaustively on centrifugal castings, listed the objects of this process as follows:

1. To produce dense castings, free from blow holes and as a result having greater strength.
2. The elimination of the use of a core resulting in economy of operation.
3. To fill the molds completely and insure sharp outlines in the castings.
4. To influence the chemical changes in the metal during casting.
5. To make possible the combination of two or more metals in a casting.

It is interesting in considering the various processes described to note how successfully each of the methods attains one or more of these objects.

Defends Use of Clay Bonding Agent

By D. M. Scott

REFERENCE to rebonding heap sand by W. F. Prince which appeared in the March 15 issue of THE FOUNDRY is a useful contribution to the general discussion on sand reclamation. It pointed out the possibilities of failure. A more detailed description of the failures to rebond heap sand would be welcomed and would prove helpful to many foundrymen, who through force of circumstances or for one reason or another have had unfortunate experiences in their attempts to rebond old sand with clay.

Incorrect manipulation of the heap sand may cost many times the value of the new sand eliminated but this fact hardly justifies one in refusing to try a process that has been a success in so many foundries. A suggestion that a committee investigate foundries that have eliminated the use of new sand and publish a description of conditions that favor this elimination, is interesting, but is not practical. So many conditions affect the sand heap that each foundry presents a special problem. The American Foundrymen's association has developed a number of methods and pieces of equipment for the benefit of those who investigated and control the character of molding sand, but these guides only may be used intelligently by men with a considerable degree of practical experience.

Correct selection of materials and correct application of these materials is possible and should result definitely in the partial or total elimination of new molding sand and the reduction of defective castings. This statement is warranted by the fact that many gray iron, malleable iron and steel foundries are operating on this basis today.

One foundry with which the writer is connected has produced over 40,000 tons of castings during the past 30 months without the use of one pound of new molding sand. Furthermore, this production was accomplished with a definite reduction in losses and cleaning costs. The writer has personal knowledge of a number of other foundries that are producing all their castings without adding any new sand to the heaps.

Official evidence may be found in the 1926 annual sand report submitted to the American Foundrymen's association by R. F. Harrington chairman of the committee on conservation and reclamation. After an extended investigation of the subject he reported that the practice of utilizing concentrated bond was worthy of the most earnest attention. The report was based on actual personal experience, also on the report from various foundries where clay bond is employed In the large eastern foundry with which he is connected and where concentrated clay bond has been employed for a considerable period it is stated that marked economies have been effected through a reduction in the amount of new sand required and a material improvement in the quality and appearance of the castings. He is responsible for the statement that in his opinion concentrated clay bond now is a definite factor in American foundry practice.

So many foundries have had similar experience in the successful use of clay bond that exception must be taken to Mr. Prince's implication that the successful foundries are endowed with some special and favorable conditions permitting them to omit the usual addition of new sand to the heaps.

No exception can be taken to his statement that foundrymen whose sand reclamation methods merely are conversational, actually do impede progress by recommending methods that do not get results. The foundry foreman whom he defends should not be compelled to replace his new molding sand with any miscellaneous material

that presents a sticky appearance. He should not be forced to develop his methods of replacing new sand without the assistance of engineers or foundrymen who successfully have applied the process, and therefore are in a position to move intelligently. A foreman is entitled to see for himself the successful use of concentrated bond in some other foundry before risking radical changes with his own sand heaps. Also he is entitled to the use of correct materials. There is nothing mysterious about the the process of rebonding old sand, but like all processes of a permanent character this one must be applied logically with due regard to the existing conditions.

Consider Simplification of Coke

By R. M. Hudson

Chief, Division of Simplified Practice,
U. S. Department of Commerce

ON APRIL 15, 1927, a committee representing certain branches of the foundry industry called on the division of simplified practice of the United States department of commerce and requested that the co-operative services of the division be extended to the foundry industry in an effort further to simplify and standardize grades, specifications, also methods of test for by-product coke for foundry purposes.

The committee, which met with R. M. Hudson, chief of the division of simplified practice, consisted of W. L. Seelback, president, Ohio State Foundrymen's association, Arthur J. Tuscany, secretary-manager of the Ohio association, and Phillip Frankel, representing Cleveland foundry interests.

According to the committee, the present evident lack of uniformity in by-product coke causes an economic waste which should, and can be reduced. Similarly, the standardization of methods of testing by-product coke would be helpful to that end.

The committee, in presenting its ideas as to the need for the action proposed, said, "A foundry that is running on one manufacturer's coke, and finds it necessary for some good reason to use another manufacturer's grade temporarily is confronted with quite a difficult problem. It is the experience of many of our members that a considerable change is necessary in cupola practice to secure proper results." It was the consensus of opinion that it would be well to canvas a list of representative producers of coke for foundry purposes for their views on the proposal, and on the possibilities for achieving the desired results through co-operative action.

A letter was sent to over 50 firms by the division of simplified practice containing the following offer:

Our division has helped to effect simplification in more than sixty lines and would like to render similar service in this instance, but before going further, we desire your advice and counsel. May we hear from you with reference to the economies and benefits which concentration on fewer varieties of coke would bring to your company, to the industry, and to the trade? Is the present diversity in specifications, etc., an advantage or a disadvantage to the coke producers? Will closer standardization simplify your production and marketing problems?

Replies to date are analyzed as follows:

Favorable	9
Unfavorable	11
Non-committal	6
More information wanted	2
Not manufacturing by-product coke or not concerned	26
No reply	4
Total	58

The replies that are classified as "unfavorable" were chiefly from the larger producers and their tenor is such as to raise the question as to whether or not anything can be accomplished along the lines of the committee's request.

The following statements from one of the 11 are typical of the view point of this group:

There would be no reduced cost of manufacturing a standardized foundry coke because no by-product company would be likely to produce two or three varieties at any time. Therefore, from the point of view of manufacturing costs, foundry coke is already simplified. One plant may make one grade and another plant another, due largely to coal supply, but no single plant is likely to make several grades unless absolutely forced to do so by inability to get preferred coals.

With no reduction in cost of manufacture there would, of course, be no reduction in cost to the dealer or consumer. In fact the reverse is likely to occur. If a standard should be established which would create an increased demand for the already limited high grade coal suitable for making foundry coke, the selling price of such coal would naturally be advanced, and would, of course, be reflected in a higher selling price for the resultant coke.

There could be no decrease in selling expense from the fact that all producers would be turning out the same grade of foundry coke.

There would be no reduction in inventory of foundry coke, as this is always small.

A prompt delivery which is believed to be possible with a smaller inventory because there is less likelihood of being out of any one line, would not apply to coke. Indeed, the adoption of a standard might force such competition for the limited supplies of suitable coal as to interfere with prompt deliveries by some of the producers.

The adoption of a standard which could be attained by plants having a suitable supply of coal might give those plants a wider market, but taking the industry as a whole, there could be no widening of the market as a result of standardization.

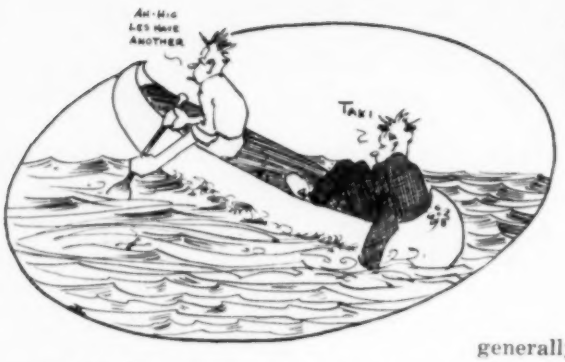
For reasons already given, there would be no increased turnover of the stock.

No less capital would be required because the same ovens and equipment now used for making one grade of foundry coke would be required for making any other grade that might be established as a standard; and since the inventories would not be either increased or decreased necessarily, the capital invested in inventories would remain the same.

There would be none of the sales advantages resulting from concentration of effort on a limited number of products because, as indicated above, no producer now makes more than one grade of foundry coke and his salesmen are therefore already able to concentrate on this one grade in pushing the product.

Among the favorable replies is one from a well-known consulting engineer, who says in part, "You will do a good work if you will collect these varieties of specifications, brands, etc., and bring them to the attention of the American Foundrymen's association, and the American Society for Testing Materials for review and discussion. The business papers concerned with the foundry field might also take an active interest."

It would seem advisable for the foundrymen through their national and regional associations to make a thorough survey of the specifications being used by their members when buying coke, and determine through that method what opportunity exists for unification within their own field. At that time, the coke producers undoubtedly will be willing to review the situation with the foundrymen and determine what revision, if any, may be required in the existing specifications. Possibly the current difficulty is due more to a relative unfamiliarity with the best of existing specifications and a consequent lack of support therefor—but that can be quite readily determined through a nation-wide survey among foundrymen as to their problems and difficulties.



Bill Gives Advice on Small Cupolas

By Pat Dwyer

EVERY now and again—a phrase sufficiently accurate under present conditions—I find an item in the paper stating that a hero, name sometimes spelled correctly, has been awarded a medal for saving another human being either from death or from a position of extreme peril to life and limb. The name of the almost victim sometimes is given correctly, but in many cases the details of the rescue reflect greater credit on the reporter's imagination than they do on his or her desire for accuracy. The simplest incident must be colored and spiced to tempt the appetite of the mentally dyspeptic newspaper reader suffering from a constant gorging of the same kind of exhilarating fare day after day.

For example, consider a typical case. Johnny Holtott, a rigger who lives at 2922 Peruna avenue, and who celebrated his twentieth birthday with becoming ceremonies on May 14 and 15 this year, strolls down to the beach on a fine Sunday afternoon—or any other afternoon if he does not feel like working. Here he meets another gent, one Tim (Red) Tracy who is also an experienced stroller, 21 years of age, a molder in an iron foundry and who boards with the Widow Gilhooley at 6713 State street. In a leisurely manner as befits perfect gentlemen, they absorb a few fingers of liquid lightning from a glass container which Tim carefully carries around with him in case of snake bites or other form of accident. Before he offers this potent fluid to his old pal, Johnny, he explains that it might never get no medals for sight, taste or smell, but it is sure there with a kick. After Johnny gets his breath he agrees wholeheartedly. Under the influence, both gentlemen crave a little action, something swift and daring, something out of the ordinary routine to which they generally are accustomed. In the absence of a bucking broncho, a ripsnorting flivver or an airship they compromise on a canoe in which they propose to paddle lil' ways out in lake and back again. Jus' show some of these here now lily finger birds how fast a canoe can go when pushed by a couple of real guys.

A bucking bronco is reasonably swift in perverse action but is only a pitifully poor second in comparison to a canoe manned by a pair of inexperienced performers. Before the couple of real guys are 10 feet from the shore the canoe slips from under them like a rolling stone. Johnny can swim, but Tim never has learned this useful accomplishment. Under ordinary circumstances Johnny would swim ashore and afterward organize a searching party. In this instance he reflects that Tim still has a bottle half filled with the elixer of life in his hip pocket and what is a half bottle among a searching party?

Johnny turns, grabs Tim by the forelock and drags him ashore despite the most vigorous objections on the part of the victim. If the aforesaid victim had his way he would wrap his arms around Johnny's neck and sink all ten fingernails in Johnny's tender skin. To avoid any unnecessary embarrassment from this undue show of affection Johnny hints to Tim to lay off that stuff for the time being. The gentle hint takes the form of a neat and skillful belt on the jaw which puts Tim in his proper place as a victim and permits Johnny to drag him ashore with a minimum amount of trouble and physical effort.

Swift examination before the inevitable crowd gathers around shows Johnny that his humane, well meant and benevolent effort has been in vain. Either as a result of gross and criminal carelessness in replacing it properly, or due to the violent struggle incident to the spill and the subsequent tow ashore, the stopper has fallen out of the bottle and the small quantity of the original content remaining has become hopelessly adulterated with lake water; excellent material for floating ships, for bathing, for extinguishing fires and for drowning kittens, but exceedingly dangerous when applied internally to the human body. Presence of a crowd which possibly might misinterpret the action, is the only factor which prevents Johnny from grabbing the careless bottle holder by the heels, dragging him approximately 100 lineal feet in a straight line from the shore and leaving him there. News of the daring exploit spreads rapidly and a movement is initiated by a gentleman who is not averse to publicity, to present a medal to the hero. Sometimes the movement is completed, but usually the interest of the prominent citizen dies after his name has been mentioned prominently in connection with the incident. Contrary to the usual impression prevailing among newspaper readers, a reporter is not stationed at every 100 yard intersection throughout the city. He does not see every-

MODEST AS A SHRINKING VIOLET, BESIDE A MOSSY STONE

Payment will be made for all contributions on foundry and pattern shop practice suitable for publication

Note—This sheet may be cut into two sections, 5 x 7 inches, and may be readily bound in note book form.

A LEXICON OF TECHNICAL TERMS

By O. W. Potter

(*Continued from Data Sheet No.* 674)

Elasticity

The property of a substance to assume its original shape after having been distorted. The amount of elastic recovery of a substance after deformation beyond elastic limit is called *refreshment, recovery, ageing, elastic-after-working.*

Elastic Deformation

This term refers to the deformation obtained by stresses below the elastic limit. When the load is removed the deformation is restored and the material returns to its original form.

Plastic Deformation

This term is used for deformation caused by stresses beyond the yield point which results in material being permanently deformed without rupture. When the load is removed the material does not return to its original shape.

Brazing and Soldering

When a hard solder composed of copper, zinc and tin are used where a strong joint is required it is called brazing. A brazed joint is stronger than an ordinary soldered joint and weaker than a weld. *Soldering* is the joining together of two metals or alloys by means of a more fusible alloy (solder) or one to which they will more readily unite with than with each other.

Calorizing

A process of coating metals with a layer of aluminum (Al_2O_3) which will protect the metal from oxidation and deterioration at comparatively high temperatures. It is used for many metals and alloys and to some extent for iron containers, tubes, etc., which are to be subjected to moderately high temperatures.

Galvanizing

This is, in general, the process of coating one metal with another. It is, however, usually referred to the process of dipping iron in a zinc bath to get a zinc coating. This coating prevents corrosion to a considerable extent.

Sherardizing

A process of producing a zinc coating on metal objects by placing the objects in contact with zinc dust at high temperature (500-700 degrees Fahr.) for a considerable time depending on the thickness of the coating desired. This also is called *vapor galvanizing.*

(*Continued on Data Sheet No.* 678)

A LEXICON OF TECHNICAL TERMS

(*Continued from Data Sheet No.* 677)

Electroplating

This is the art of making electrolytic depositions of one metal on another for the purpose of improving the appearance or the wearing qualities of the metal covered, or both.

The iron carbon series of alloys are electroplated quite frequently. It is often called just *plating* or many designate it by the coating material, as *nickel-plated, chromium-plated,* etc.

Electro Chemical Cleaning

Metals and alloys that are to be painted, enamelled, or plated first must be cleaned thoroughly. The electrolytic process is used in some cases and has been found to be good. The object to be cleaned is immersed in a solution of alkaline substances (sodium carbonate, potassium carbonate, potassium hydroxide, or sodium hydroxide) through which a current pressure of from 4 to 8 volts is passed. The combination of the electrical and chemical action produces a clean surface; especially good for removing all traces of organic substances (oils, greases, etc.).

Pickling

In many processes of manufacture it is necessary that the material be perfectly clean before being painted, enamelled, plated, etc. To remove all of the scale, dirt, oxides, etc. the metal is submerged in an acid which removes this undesirable material. This acid is usually sulphuric acid but others may be used.

Carburizing

Under certain conditions steel absorbs considerable carbon. This property is called case carburizing or *case hardening, carbonizing* or *cementation.* Certain steels are especially adapted to this absorption. By this process a high carbon shell and a low carbon interior may be obtained. This has many advantages in the industrial world.

Piston wrist pins, transmission gears and cams are examples of common uses of carburized steel.

Self Hardening

This is the property of certain tool steels to harden themselves by simply cooling in air. It maintains a good cutting edge up to a red heat or to the breaking down temperature. A steel containing 1.50 per cent carbon and 5-8 per cent tungsten is a typical self-hardening steel.

This steel is often called *Mushet steel, air hardening steel, air quenched steel, high speed steel, quick speed steel, rapid tool steel,* and *natural steel.*

(*Continued on Data Sheet No.* 679)

Seeing America with The Foundry

Little Journeys to the homes of our readers

KENTUCKY has a total of 51 foundries of which

40 Melt Gray Iron
11 Exclusive Nonferrous
21 Nonferrous Departments of other Foundries
22 Aluminum

KENTUCKY—"THE BLUE GRASS STATE" — is perhaps better known and famous for its thoroughbred horses than any other of its contributions. Its beautiful grass covered plains in the north central part have reared many of the winners of the famous Kentucky Derbys and gained prominence on the other race tracks of the country.

Kentucky's history dates back to colonia days for the first settlement west of the Alleghanies was made in Kentucky just before the outbreak of the Revolution, when it entered the Union as a state, June 1, 1792.

Kentucky has been producing 20,000,000 tons of coal a year, but the output has increased today to about 25,000,000 tons. It is the fifth coal state of the Union and the value of the output is about three-fourths that of all other minerals combined. Another product of increasing importance is petroleum and a million and a quarter barrels a year are obtained.

Tobacco is the far most important agricultural product and in this the state leads all others of the Union. The annual crop, averaging 450,000,000 pounds is more than that of North Carolina and Virginia combined and is about one third the total crop of the entire country.

The making of tobacco products is one of the leading industries and Louisville is a world center for marketing leaf tobacco. Formerly Kentucky was a leading state in the distillation of whisky, but war-time prohibition and the Constitutional amendment ended that industry. The manufacture of lumber and timber products is rapidly increasing in importance and the value is approximately $25,000,000 a year.

In KENTUCKY THE FOUNDRY has 40 paid subscribers

"Wherever metals are cast you'll find THE FOUNDRY"

thing which happens. In the foregoing typical instance he arrives on the scene after the hero, the victim and the crowd have disappeared. He looks over the ground carefully, notes where the body was dragged ashore, takes a picture of the canoe and then interviews the few stragglers left on the scene.

One of the main rules in a newspaper office is accuracy. Names must be spelled correctly. Ages and addresses must be incorporated in the beginning of a story. On the day following the rescue, thousands of readers glance over the story after they have examined the page of comic strips. The ages, names and addresses leave no impression. The average reader is more familiar with and more interested in the names and antics of the fictitious characters in the funnies than he is in incidents connected with the lives of his own fellow citizens. When he throws his paper away in the morning he can discuss the doings of the so-called funny people, but if he has occasion for example to refer to our near drowning story he will remark vaguely that he did see something about two birds who fell out of a canoe or something. All this, mind you, after reading a following first hand, authoritive and detailed account of the event including ages, names and addresses:

MEDALS MAY COME AND MEDALS MAY GO, BUT THEIR GIVERS ALWAYS ARE WITH US

RISKS LIFE TO SAVE CHUM FROM ANGRY WAVES

After battling bravely against the tremendous undertow for nearly half an hour and in full view of hundreds of horror stricken spectators, Felix J. Hunyunk 1571 Fairview avenue, succeeded in bringing ashore his life long chum Jeremiah Trixie, 659 Maple street, following the capsizing of their canoe by the wash of a passing tug boat. The rescuer modestly disclaimed all praise and said the entire credit was due his little gray haired mother who had taught him to swim at her knee when he was but a little boy back in the old home on the farm.

Frankie and Jimmie had been boyhood chums and the friendship had been renewed when they met in the big city where they had come to carve out a career and where they dreamed some day of establishing their respective mothers in positions of ease and comfort. How nearly they came to having this fond dream frustrated was illustrated in the foregoing incident. Both young men insisted that no word of the accident should be sent to their homes.

Replying to an inquiry by our reporter, Fred stated that his superb physical development was due partly to a clean, abstemious life and partly to his occupation in an iron foundry where huge blocks of iron are hammered and cut and pounded and shaped into myriads of forms and sold as castings. Every day, stripped to the buff, he juggles the red hot glowing slabs as easily and deftly as a magician on the stage keeps a succession of colored balls in the air.

Immediately after the rescue Peter J. Huggins, 1594 Easy street and alderman from the third ward initiated a movement to bestow a medal or some other suitable form of recognition on the hero. The movement met with instantaneous response and will be brought up at the next meeting of the city council.

After reading a somewhat similar story the other night with all the incidents garbled beyond recognition I intimated to Bill that I had a good mind to write to the paper and direct attention to the more glarin' errors.

"What's the use?" said he. "The fourth assistant editor or the printer's devil or whoever opens the mail would read your letter, laugh at it, cheerfully consign your soul and the souls of all your relatives past, present and to come, to eternal torment and then carelessly toss the communication into the maw of the nearest waste basket.

"The modern newspaper is driven at such relentless speed that it has no time for picking up stitches. What's done, is done, and that's the end of it. A newspaper will prophesy any distance into the future, but steadfastly refuses to look backward. The past, any past, even yesterday is as dead as Pontius Pilate's billy goat. Sunday's paper is printed on Wednesday and is on sale in communities hundreds of miles away Saturday night. Evening papers are on the street at noon and the morning paper is on sale before midnight of the night before. I was talking to a man the other day who told me that the covers for the November issue of a certain weekly paper already were on the press.

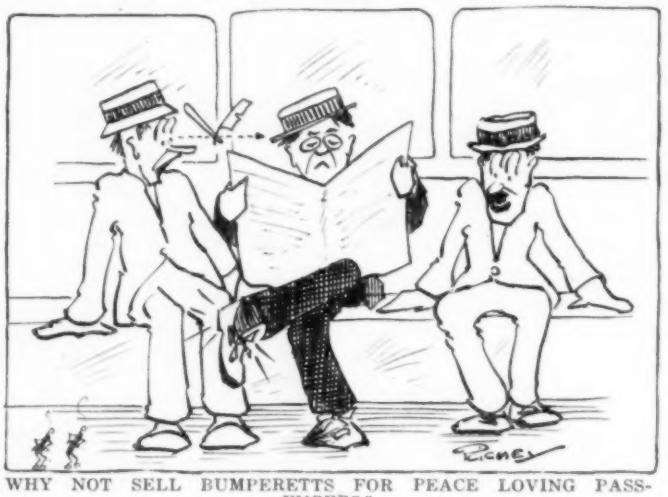
"Forget it my lad. If you feel you cannot rest until you unburden your mind, then by all means grab a sheet of paper, a good big sheet, and spill all the venom out of your system. Loosen up. Let 'er go. Tell this here now newspaper guy exactly what you think of him and his despicable rag. Shoot his past, present and future full of large, gaping holes fringed and gangrenous at the edges. Nail his quivering hide to the red barn door. Fasten his long ears to the old gospel pole. Pour kerosene oil over the remains and send it up in hallelujah blaze of glory. Read the epistle over twice to get the full flavor and then—destroy it. Next day if you happen to meet the editor you will be so filled with the milk of human kindness that if he is silly enough to permit the familiarity, you will be willing to kiss him.

"Whenever I read or hear of one of these medal presentation stories I wonder why some public spirited citizen does not start a movement to confer a medal on one of us law abiding lads who has saved dozens of lives."

"What do you mean, dozens of lives?" I inquired incredulously. "I hope this is not one of your silly, vulgar soldier jokes based on the teeming life in the trenches."

"No," said Bill. "I am not thinking of conditions in the trenches. None of the people whose lives I have saved has been aware of his narrow escape. If all these people were stacked in a pyramid the apex would pierce the sky. If they were placed end to end, horizontally in the position I should like to see them, they would form a limp and paralyzed belt around the earth at the equator. In a word, my lad and coming right down to brass tacks I have saved the lives of all these potential victims by the exercise of the most heroic re-

straint. "The list includes the road hog who edges me into the ditch and his first cousin who edges in ahead of me in a line at the ticket window of a theater or a railroad station, the kid who sniffs his nose and his grown-up brother the hawker who sits alongside me on the street car, the spineless individual who simultaneously chews gum and breathes cigaret smoke in my eyes when he talks drivel to me; the unknown member of the family who squeezes the neck instead of the base of the tooth paste tube; the dandified pig who spreads his beauty outfit all over the seat and monopolizes one of the basins in the wash room of a sleeper for an hour in the morning; the mental cripple who sits behind me at a show and beats time on the back of the seat; the moron with the adenoids who reads the movie titles aloud—and stumbles over all the words with more than two syllables." "Your theory is ingenious," I said. "I am in full sympathy with it, but it is not practical. Medals would be more numerous than license plates if your idea was adopted."



WHY NOT SELL BUMPERETTS FOR PEACE LOVING PASSENGERS?

"Maybe so," said Bill, "maybe so, but talking about medals and all that kind of thing I know foundrymen who should have medals in recognition of the effort they display in making castings under apparently impossible conditions. I had a letter recently from an engineer in charge of a plant situated away out back of beyond who said that high freight rates and delays in shipments had led him for some time to consider the advisability of making many of the iron castings required to replace those worn in service at a coal mining and coke plant situated a long distance from any manufacturing center.

"He said he had a small place fitted up as a foundry where one of his men, a skilled molder, makes brass castings. The engineer admitted he was not a foundryman himself and was not familiar with iron melting equipment. Recently he put up a small cupola, but it does not work satisfactorily and he would appreciate advice on the subject.

"The cupola is made from a section of 16-inch pipe, 5 feet high. It is lined with fire brick chipped to a circle 10 inches in diameter on the inside and is provided with a drop bottom 2 feet above the floor. The blast is piped through a one-inch pipe from a compressed air line and enters the cupola through two 3-inch diameter tuyeres. The tuyeres extend outside the cupola and form an air belt in which the air has a chance to expand and therefore reduce the pressure. The air in the main line has a working pressure of 100 pounds to the square inch. The coke is high in ash and while the device melted iron for a short time on the trial run a bridge formed and stopped operation after melting about 100 pounds. He wanted to know if a larger cupola would solve the problem.

"In my reply I pointed out that the fact he was not a foundryman made his problem more difficult. The most logical solution of the problem would be to order a small melting unit from a manufacturer of that type of equipment. For his information I enclosed a list of the names and addresses of firms who make small melting plants that would meet his requirements. However, if he was not in a position to have one shipped such a long distance the following might be of service in the construction of a home made unit.

"Character and shape of the shell is not a factor of major importance. Its only purpose is to hold the brick lining in place. It may be round, square or oval. Instances are on record of rectangular brick stacks built without any shell or held together with a few tie rods or by a row of cast iron staves. In several instances empty oil drums with the top and bottom knocked out have been lined with brick. A cupola with an inside diameter of 10 inches is too small for practical purpose. I suggested he try one with 14 or better still 18 inches. The body of coke in a 10-inch cupola chills too rapidly and in his case he was forcing too much air into the cupola. His tuyeres and air supply were ample for a much larger furnace. A pressure of 4 or 5 ounces is sufficient in a small cupola and may be secured through the present arrangement of a larger air belt in which the air has a chance to expand.

"I advised him to carry the coke bed about 30 inches above the tuyeres and to break the iron in small pieces. For an 18-inch cupola I suggested he try a charge of 100 pounds of iron with a layer of coke 4 inches thick between the charges. After a few trials he could modify the charges to the best advantage. A few handfuls of limestone, or any of the proprietary fluxes could be added to each charge. In the event that his heats ran over an hour he might find it necessary to provide a slag hole at the back of the cupola to drain the slag. This hole should be located about 4 inches below the tuyeres." "Now," said Bill, "coming back for a moment to the nuisances in human form who infest this fair land, I had a seance with one the other day. I did not get a medal, but I had a few moments of satisfaction. This bird sat next to me on a street car. He was reading a paper and had one leg crossed over the other in such a manner that with each lurch of the car his boot rubbed against my legs. I revolved various methods of retaliation ranging in intensity from stepping violently on his other foot to landing him a stiff jolt on the wishbone. Before I arrived at a decision he reached into an inside pocket, adjusted a pair of glasses and continued reading. 'Pardon me, friend,' I said, tapping him on the knee with the good old index finger. 'Do you find that glasses improve your vision?'

"'Why, yes,' he replied. Then unnecessarily and insolently he added, 'Why do you think I wear them? To keep my ears warm?'

"'No,' I said. 'Your ears are big enough to take care of themselves, but if you can see better with your glasses, you might see if you can find a place on the floor to park your big crooked feet!'"

Export Many Wheels

In 1926 this country exported 37,360 pounds of carwheels and axles compared to 44,655 pounds in 1925 or a loss of 16.3 per cent.

Chicago Pneumatic Tool Co., New York, has removed its St. Louis office, service department and warehouse to 1931 Washington avenue, St. Louis.

Planer Speeds Pattern Shop Work

Hand Operations Eliminated with Machine Which Smooths Surfaces, Cuts Angles and Produces the Required Draft

By Walter C. Ewalt

THE patternmaker, as a worker in wood may visualize easily the picturesque surroundings under which the material with which he works is produced. The woodlands, hills and mountains, running streams, mighty trees, lumber jacks, sound of the axe, hum of the saws, and the buzz of the planer all may be included in the mental picture. Mighty forces are at work in the woods producing material to give homes to our families, shelter during our working hours, safety to our travels, and artistic furniture for our comforts. Thousands of examples of the usefulness of the wonderful gift of nature surround us. It is interesting to note that patterns made of wood may be considered the most valuable part of many foundries and enable the plant to produce castings.

The hand planer, sometimes called the buzz planer, is one of the important machines found in the pattern shop. Perfections in the design of the planer have resulted in the use of the hand planer becoming almost a lost art in the pattern shop. When the machine is in good condition, long or short pieces of lumber may be planed sufficiently smooth and straight for glue joints. Wide boards may be planed out of wind. Square cuts, bevels and drafts may be made easily so that much of the surfacing, jointing and fitting work necessary in the pattern shop may be accomplished on the machine. Cuts, ranging from extremely thin to heavy, may be made with speed and accuracy.

The hand jointer was designed to save time; to accomplish in a few minutes an operation which otherwise would take hours. While several types of machines are made, the principle employed in each is the same. The three important parts of each machine are the frame or bed which becomes the foundation, the cylinder upon which the cutting knives are mounted, and the tables, one of which is located on each side of the cylinder. The frame may be one piece casting or mounted on legs or columns. The cylinder is forged crucible steel and runs in ball or babbitted bearings supported by the frame. The cylinders are made in several types, one including safety features being shown in Fig. 1. The type of cylinder shown in the illustration has several good features, since it practically closes the gap between the tables. In case of accident, probably only the ends of the fingers will be damaged instead of the entire hand.

Knives on this cylinder are special steel properly tempered. They are thin and may be sharpened easily. Since the knives are held close to the cutting edge, the possibility of vibration is decreased, and an exceptionally smooth cut may be secured. The knives are ground at an angle of 45 degrees and extreme care should be exercised in grinding not to overheat the knife. If sufficient heat is produced in grinding to turn the color of the steel, cracks probably will develop on the edge when the knife is placed in service. To secure the best results it is recommended that an oil stone grinder, a soft emery or a grindstone with plenty of water be used. The grinding should not be hurried and heavy cuts should not be made. A whetstone is used after grinding to

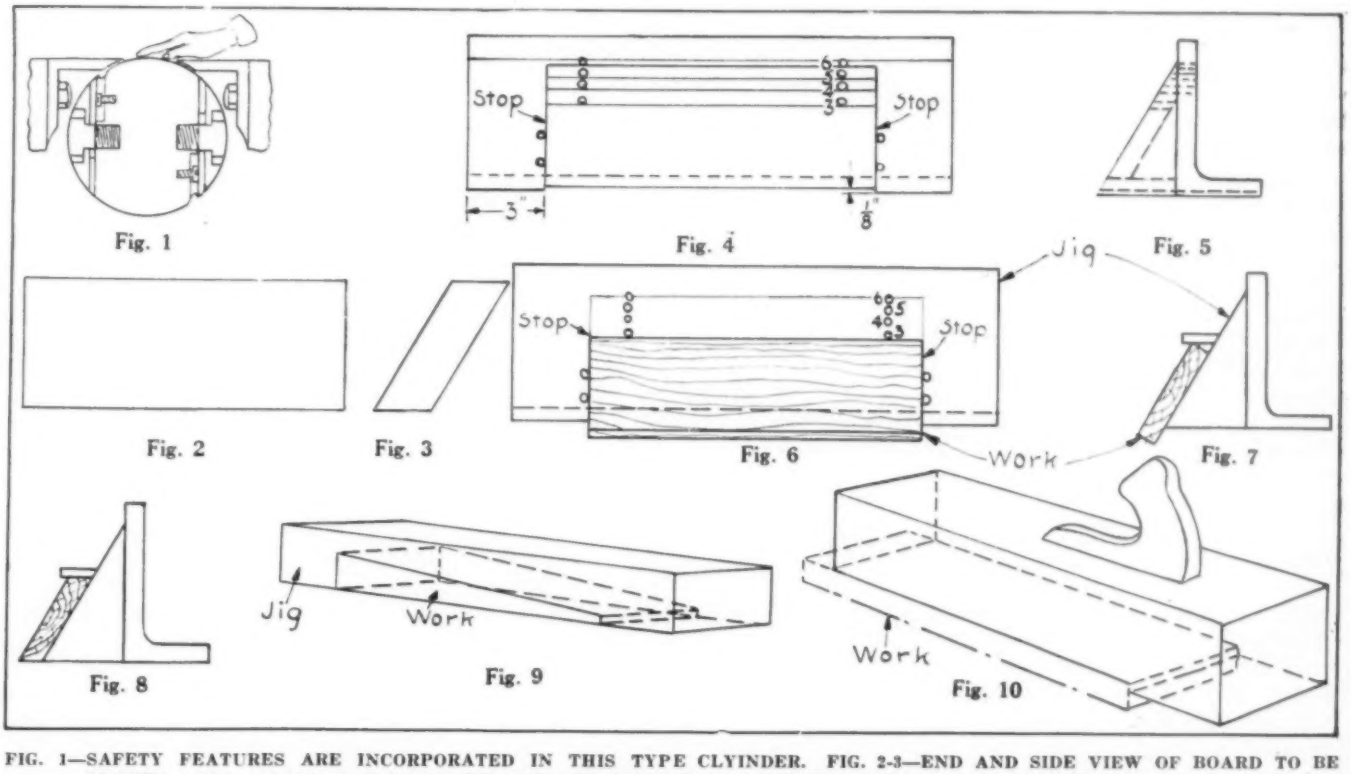


Fig. 1 Fig. 2 Fig. 3 Fig. 4 Fig. 5 Fig. 6 Fig. 7 Fig. 8 Fig. 9 Fig. 10

FIG. 1—SAFETY FEATURES ARE INCORPORATED IN THIS TYPE CLYINDER. FIG. 2-3—END AND SIDE VIEW OF BOARD TO BE PLANED. FIG. 4 TO 8—A JIG MAY BE USED TO MAKE WEDGE SHAPED WORK. FIG. 9—WEDGES MAY BE MADE ON THE PLANER. FIG. 10—A PUSH BLOCK IS USED WITH THIN WORK

secure the proper edge. The stone also may be used several times to improve the cutting edge before grinding is necessary.

Tables may be adjusted both vertically and horizontally. The table also may have a tilting device which permits the patternmaker to obtain the draft upon any lumber. Any angle desired also may be obtained with the same device. A fence is located on top the tables, usually being attached to the rear table. The fence acts as a guide for the work and directs the angle at which the surface is planed. The fence is adjustable to an angle of 45 degrees. All of the adjustments on the machine are made with screws and gears.

In ordinary straight planing, the back or rear table remains stationary with the plane of its surface in line with the knives when at the top of their circle of motion. When starting the plane, the lumber is placed on the front table which is adjusted or lowered below the top of the knife circle to the thickness of cut desired. The lumber then is fed into the knives. Up to this time the front table acts as a guide but after passing over the knives, the rear or stationary table acts as a guide and keeps the lumber from rocking.

Planes are made in a large range of size. These extend from the small 4-inch bench planer operated with the light circuit, to the large 42-inch operated by a 5 or 10 horsepower motor. The small planer has become quite popular as it saves considerable time running back and forth to the large planer. It has most of the good features of the larger planers, only on a smaller scale.

A new style of planer now on the market is called the disk planer and jointer. The principle is different from the planer previously mentioned. The knives in this planer are small and a large number are used. They are set in at right angles to a 10-inch disk which revolves in a clockwise direction parallel to the table. The knives run in an opening in the table ⅜-inch wide. It is claimed that no chatter is found when planing knots cross grain or cat grain and that a perfectly smooth surface suitable for glue joints may be obtained under these conditions. End grain to end grain glue joints also may be accomplished. It has a tilting bed so that draft may be planed for pattern work. This planer has a planing surface width of 6½ inches.

Usually the pattern shop is equipped with a hand planer having knives 14 to 18 inches long. These sizes are extremely serviceable for shops doing ordinary pattern work. Duplicate parallel or wedge shaped work on the hand planer is often accomplished with jigs. An example is given to show the principle by which work of a similar nature may be done. Fig. 2 shows a side view of the finished board to be planed and Fig. 3 shows the end view. The jig is made first and constructed at the proper angle as shown in Fig. 4 and Fig. 5. The jig board may be made wide to accommodate wider lumber if necessary. A line is scribed ⅛ inch from the edge at the bottom and 3 inches from each end and the board is sawed out to this line. This gives a clearance between the front and back legs of the board between the points *Stop* and corresponds to the depth of the planer cut. Lines 3, 4, 5 and 6 are scribed on the board and holes bored through the board just above the lines to receive one end square pegs for stops. In operating the board, which for example is finished to 3 inches, is placed against the jig as at Fig. 6. It will be noticed the board is somewhat wider to allow planing stock. The jig may be stationary or the board and the jig together pushed over the knives from *Stop* sliding the board down on the jig after each cut and making as many cuts as is necessary to make the bevel on the bottom edge. When this is completed, the edges of the board are reversed and the pegs are placed at the three inch mark. The finished edge of the board is placed under the pegs and jig and board are run over the knives, as in Fig. 7, care being taken not to run the legs of the jig over the knives. The board, as finished in the jig, is shown in Fig. 8. The wedge jig shown in Fig. 9 is made in somewhat the same manner. Various other operations using jigs on the planer will no doubt be suggested to the patternmaker.

As the jointer is a dangerous machine, guards for the knives should be provided for the operator's safety. A number of these of various styles, may be secured from various manufacturers.

As there is danger of slipping when pushing work across the planer and accidentally placing the hands in the knives, the floor should have a rubber mat, the floor painted and sand sprinkled on it while the paint is wet; discarded sand discs nailed to the floor or some means provided to prevent slipping.

In planing, the hands should be placed on top of the work and the palm of the right hand should not rest on the end of the board, especially when coming up to the knives. The push block, shown in Fig. 10, should be used when planing thin boards.

Stepping Up Production

(*Concluded from Page* 554)

jobbing conditions where he had to prepare his own sand, rods and plates and where he had to make allowance for worn and crooked boxes and for warped plates. Probably not one jobbing coremaker would risk one of these cores without reinforcing rods or wires of some kind and yet here they are made literally in thousands every day without a reinforcing rod or wire of any kind. Absolutely nothing in the core but sand and oil.

Relation of the sand and bonding material is calculated so nicely that the dried cores meet a maximum transverse test before they are placed in the mold and yet the bond is burned so completely by the comparatively light casting, that the sand runs out through one or two small openings in the casting as readily as sand through a sand glass or black powder through the nozzle of an old powder horn.

Wants Grate Bar Analysis

Question—What is the best composition of iron for a grate bar which must operate at high temperature? We desire to secure an iron which will have a long life under these conditions.

Answer—About the only things which can be done with gray iron to assist its heat resisting properties are to increase the sulphur contents and to lower the silicon as much as possible, to give high combined carbon without making the casting too brittle. The amount of silicon cannot be determined without knowing the dimensions of the grate bar, and we would suggest that you gradually lower this silicon until you notice trouble from hard iron. Then by raising the silicon slightly, you will have the correct amount. Of course, if you have a chemist, he can tell you the correct amount of silicon to use. The sulphur can be run as high as 0.25 per cent.

A better resisting metal can be made by raising the sulphur to 0.25 per cent and lowering the silicon so that the casting, as it comes from the mold, is entirely white iron. This will be quite brittle and it might not be satisfactory to use it without further treatment. By annealing it thoroughly as in the malleable process, the iron can be made less brittle and will withstand the heat well.

British Watch Grinding Wheels

Accidents Are Kept Low by Following Official Safety Rules and Using Substantial Wheel Guards—Abrasive Wheels Are Replacing Sandstones

By W. Hamilton Gordon

IN THE annual report of the British government chief inspector of factories it is emphasized that in some industries the sandstone is being superseded by the abrasive wheel. This change has official approbation owing to the increased safety it ensures. Mr. Macklin, the engineering inspector who deals specifically with the grinding trades, states that the increasing use of manufactured abrasive wheels was a noticeable feature of the past 12 months, particularly in those where grinding was formerly performed by natural sandstones. He sees in the abolition of the sandstone a forward step in the improvement of industrial environment. An investigation carried out a few years ago proved that the dust from abrasive wheels was less malignant than that from sandstones because it contained little or no free silica; in addition, owing to the much longer life of abrasive wheels the dust evolved was proportionately less in quantity.

A number of large producers of textile machinery and stove grate makers have entirely discarded natural grindstones with complete satisfaction, both hygienically and economically, while many other firms in the engineering trades are in the transition stage. In these industries the articles ground are mainly cast iron and the object of grinding is to obtain a bright finish. In the cutlery and edge-tool trades, the substitution of grindstones by abrasive wheels is more difficult because grinding is performed to produce a cutting edge or a sharp edge and any undue heat caused by grinding is liable to draw the temper of the steel and ruin the article. The production of abrasive wheels possessing the requisite grinding property and which will not excessively heat the steel was to some extent a new field requiring experiment and research. Therefore progress in substitution has been much slower. A few firms have, however, completely changed over and a large number are in the experimental stage. Though at present there is not unanimity as to the merits of the abrasive wheel there is a strong probability that in most industries the difficulty of obtaining wheels of the requisite grit and grade will be overcome and the prejudice of the operatives not a small obstacle, also removed, it is expected.

The conditions as to safety in the use of abrasive wheels begin to show a marked improvement and not a little of the credit is due to the manufacturers of the wheels who have carried out propaganda work regarding the methods of mounting the wheels and efficiently maintaining the machines, in addition to the need of running the wheels at safe speeds and providing well-designed guards of adequate strength. In many works, too, the official safety pamphlet on this subject has been made good use of by those responsible for the grinding machinery.

As a sequel to the bursting of a large abrasive wheel the management of an engineering works prepared the following rules for millwrights with regard to running and mounting such wheels:

1—The official chart of grinding wheels must be kept up to date. Any alteration in the location of machine, as well as any alteration in dimensions and speed of wheels must be entered thereon, together with particulars of all additional machines installed, at the time the change is made.

2—Only skilled millrights acting upon the instructions of the foremen will be allowed to mount wheels on grinding machines. They may, however, be assisted by an apprentice or laborer.

3—The millwright will be held responsible for seeing that the correct wheel for the machine is drawn from the stores and mounted in a proper manner, and in order to make sure that this is done, he must observe the following rules:

See that the correct machine number and wheel particulars are entered on the stores' requisition.

On receiving the wheel from the stores it must be tested for soundness by ringing.

Check all dimensions of the wheel and compare with those on the chart, and also on the makers' tag attached to the wheel.

Before the old wheels are taken off the machine, run up to speed and make sure, by using speedometer and watch, that the speed does not exceed that recommended by the makers as entered on the tag and also on the wheel chart.

Should the wheel appear not to be sound, or should any of the dimensions or the speed not agree with the particulars on the chart and on the makers' tag, the matter must be immediately reported to the foreman, befor further action is taken.

The millwright concerned will not be considered to have completed his job until the new wheels are fixed, the belt put on the machine, the guard fixed, the rest put in position, the wheel trued up and the machine is running in balance and without vibration.

4—On completion of the job the millwright will sign the back of the makers' tag, giving the machine number and date when the work is completed.

5—Should the wheelwright be doubtful as to the suitability of the machine, the securing flanges or the wheels, the matter should be immediately reported to the foreman. Warning—In no case should the peripheral speed of abrasive wheels exceed 5000 feet per minute.

As in previous years, says Mr. Macklin, it must again be remarked that many ventilating engineers when designing dust exhaust plant for abrasive wheels do not arrange that the hoods over the wheels are sufficiently substantial and rigidly anchored so as to serve also as guards in the event of the wheels bursting. Usually the hood is of thin sheet iron and the user has to attach a contrivance of his own to secure safety. This is never as satisfactory as when the hood and guard are incorporated in one unit.

During the year, 1925, there were 75 accidents to operatives reported as due to the fracture of grindstones and other abrasive wheels and of these three were fatal.

Protects Furnace Walls

A good protection for walls of crucible furnaces consists in coating them with a wash composed of 75 per cent carborundum and 25 per cent sodium silicate. This fuses to a glassy veneer which is said to be resistant to mechanical injury and the chemical action of flames.

What Others Are Thinking

Abstracts Selected from the World's Foundry Literature

Analyze Brass Rapidly

A method by which zinc and lead in brass can be determined in a short time is described in *Zeitschrift fur Metallkunde*, April 1927. The method is based on the volatility of zinc and lead at elevated temperatures and the sample may consist of drillings, borings or granulated brass, made by pouring molten brass into water. The sample is weighed in a small test tube *A* of fused quartz and the tube placed in a larger, weighed test tube *B* of fused quartz, which then is placed in a container, also made of fused quartz. The container is connected with a high vacuum pump and the air is pumped out. This takes only a few seconds and an electric furnace, preheated to 1190 degrees Cent. is then placed around the container. After six minutes the furnace is removed and the container is cooled by spraying it with water. On account of its low coefficient of expansion, fused quartz can be quenched from a red heat into cold water without danger of cracking. Test tube *A* which now contains only copper is weighed. Test tube *B* contains the lead and a part of the zinc. By heating the tube to 600 degrees Cent. the zinc is removed and the amount of lead can be determined. Zinc which is more volatile than lead is determined by subtracting the weight of the original lead from the weight of the original sample.

Crystallization Is Important

Seventeenth Annual May Lecture, by Sir Henry A. Miers, Storey's Gate, Westminster, London, on May 11.

The author recalls in the address experiments made 20 years ago by himself and Miss Isaac which seemed at that time to show that when a solution is cooled below its saturation temperature it passes into a *metastable* state in which crystals can be produced only by introducing a fragment of the dissolved substance or of one isomorphous with it, and that at a lower temperature it passes into a *labile* state in which crystals may appear spontaneously. Later investigations have shown that in the metastable state crystallization also can be produced by shock.

However, the author considers that his experiments record the normal behaviour of crystallizing liquids and that crystallization only takes place with some degree of supersaturation or undercooling. In his experiments there was always a sudden outburst of crystal growth at a definite temperature.

Little importance is ascribed to undercooling by most geologists in their speculations concerning the crystallization of molten magmas, but to many metallurgists it is an important factor. The structure of alloys in many cases is attributed to a suspended crystallization of this nature; not only as they solidify from the molten state, but also during the crystalline changes which take place in the solid alloy with change of temperature, for example, in steel and in magnetic alloys.

Uses Nickel in Bronze

Nickel Aluminum Bronzes, by E. D. Gleason, *Metal Industry* (London), May 6, 1927.

According to the author nickel aluminum bronzes should have a wide range of uses. An alloy of copper, 88 per cent; nickel 7 per cent; tin, 2 per cent; and 3 per cent of a manganese-aluminum alloy containing 25 per cent manganese and 75 per cent aluminum, gave the following physical properties: Ultimate tensile strength, 89,500 pounds per square inch; yield point, 55,000 pounds per square inch; elongation in 2 inches, 28 per cent.

Nickel aluminum bronze can be forged hot and is handled easily for melting under regular brass foundry conditions, either from the ingot or new metal. In making new metal, run down the copper and nickel together under a good cover of borax glass. Then add the manganese-aluminum alloy. Stir well and add the tin last.

The author also mentions another alloy containing copper, 80 pounds; nickel, 5½ pounds; and aluminum, 72 pounds which gave the following physical properties: Ultimate tensile strength, 66,125 pounds per square inch; yield point, 30,000 pounds per square inch; elongation in 2 inches, 45 per cent.

Describes French Practice

Manufacture of Certain Iron Castings for Railroad Material (Cylinders and Piston Rings), by M. Audo, *Bulletin*, Association Technique de Fonderie, Paris, April, 1927.

Specifications for cast iron used in the shops of the French railroads are given. A description of the cupolas operated in the foundry of the Paris-Orleans railroad, St. Pierre des Corps, is given. In describing the casting of locomotive cylinders the author points out that in America, Great Britain and Switzerland, they are cast horizontally, whereas in France and Belgium they are cast vertically. A type of universal flask made up in sections and used in this operation is described in detail. The molds are dried twice; first the actual mold is dried, the second drying operation taking place after the cores have been placed. For low-pressure cylinders the number of cores varies from 28 to 37 and the special precautions taken to make the cores and verify their dimensions are given. The speeds of pouring are given for various weights of castings, also the method of pouring.

The author next explains how the hollow cylinders from which piston rings are made, are cast. He tells why pouring is done rapidly, at the rate of 100 kilograms in 15 seconds. The preparation of the molds for these hollow cylinders is described in detail. Any remarks made on the behaviour of the piston rings during machining and in service are communicated to the foundry, and defective castings are returned for investigational purposes.

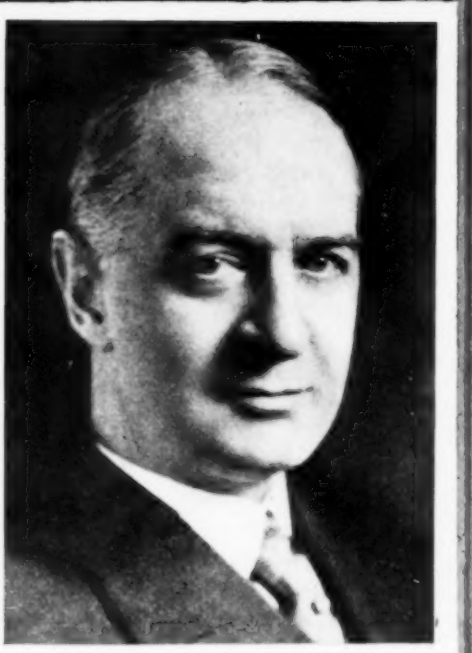
With regard to the iron used for these castings, the author, after having described the testing of the material, gives the compositions of the iron and steel used in the charges. Cast iron scrap coming from discarded cylinders is remelted, analyzed and classified; the steel scrap, which contains 1.5 per cent silicon, comes from discarded springs. The final composition of the castings and their physical properties are given. The analysis of the charges used in two foreign foundries for similar work also is given. In conclusion the author gives results taken from the evaluation of wear in service. On locomotives having run over 32,000 miles the diameter of the high pressure cylinders had only increased by 0.002 inch, no increase being found on the other cylinders. Results of physical tests effected on pieces cast with the cylinders and of the same thickness are shown.

Gathers Data on Sulphur

The Influence of Sulphur in Cast Iron, by J. E. Hurst, *Foundry Trade Journal*, April 14 and May 19, 1927.

Sulphur is held by many to be the cause of blowholes and other foundry difficulties, but the author shows from data gathered by other investigators and himself that if the manganese content is 3 times that of the sulphur, no harmful results are exhibited as the sulphur is converted to MnS. In higher silicon irons the ratio may be less than 3 to 1. Even in the absence of sufficient manganese, the presence of FeS in appreciable quantities will not have any serious effect in the presence of the higher silicon and total carbon contents, and particularly when the rate of cooling is comparatively slow. The author also states that it is highly probable that in the presence of manganese, the comparatively high safe limit of sulphur specified by Dr. Moldenke (0.30 per cent) can be exceeded with safety. Mr. Hurst says that he can see no reason for discriminating against low silicon, low total carbon pig iron obtained by synthetic or semi-synthetic means even though the sulphur is higher than that of ordinary pig because the influence of sulphur is not likely to be accompanied by anything like the disastrous results which many text books indicate.

The FOUNDRY Family Photograph Album



Upper Left

S. WELLS UTLEY, President, American Foundrymen's Association, Detroit

Lower Left

ARTHUR F. BRAID, Metal & Thermit Corp., New York

Upper Right

ROBERT E. BELT, Secretary, Malleable Iron Research Institute, Cleveland

Lower Right

ROBERT E. WENDT, Purdue University, Lafayette, Ind.

The Shakeout

DAN M. AVEY, Editor

PAT DWYER, Engineering Editor
FRANK G. STEINEBACH, Associate Editor

CHARLES VICKERS, Nonferrous Editor
EDWIN BREMER, Associate Editor

¶ Commendable Action

COMMENDATION is due the American Society for Testing Materials and those of its membership who avoided bringing to issue proposed revisions in the specification for carbon steel valves, flanges and fittings for high temperature service. As reported in the proceedings of the steel castings session of the American Foundrymen's association, the revisions provided for the exclusive use of castings made from metal melted in open-hearth or electric furnaces. Further rigid limits were provided for carbon, manganese and silicon, in addition to the usual restrictions on sulphur and phosphorus. Resolutions were adopted protesting to the executive committee of the American Society for Testing Materials against the adoption of these revisions which already had been approved by a rather indecisive vote of the committee and awaited only the approval on the floor of the convention at French Lick, Ind., June 22.

THE action taken, the return of the proposed specifications to the committee for further consideration, on the motion of Prof. A. E. White, University of Michigan, Ann Arbor, Mich., is reported on another page of this issue. That Professor White's action was appreciated, was apparent from the comment of those vitally interested and others who attended the American Society for Testing Materials meeting merely to defend a principle which they felt was at stake.

THE Testing society has made an enviable record for disinterested service during the past thirty years. The success of its efforts may be traced to the high standard of fairness maintained and to the adoption only of those standards which both producer and consumer agree are practical. Had the policy of determining method of manufacturing been followed in the early days, to the degree attempted in the steel casting revision that eliminated the crucible and converter furnaces, is it not conceiveable that early experimental work on the electric furnace itself might not have been hampered? Manufacturers should be left free to perfect their own details of practice. The consumer is interested only in the quality and service of the commodity he buys.

¶ Shove It Under the Door

WHEN outraged public opinion finally closed permanently a notorious gambling dive in a small western railroad town, many of the old habitues felt lost. It is said that some of them who cashed their pay checks with the gambler every month and then bucked the tiger until their roll was gone, used to wander around, disconsolate, after the place was closed, and shove their pay checks under the door.

PERHAPS the same free handed motives actuate a certain class of foundries whose sales attitude is reflected in the following quotation from a sales letter:

> *Some time ago, we put into practice a novel idea to engage the surplus capacity of our foundry. This idea has more than met expectations, since we are supplying castings far and wide. Briefly, the idea is this: We have a foundry with a capacity far in excess of our own manufacturing requirements. Realizing that by supplying our foundry to full capacity we reduce the overhead cost per unit, we offer our excess tonnage of castings to outside users on the basis of our overhead cost ONLY and without direct profit what ever. We effect a considerable saving to our customers and at the same time reduce the overhead on our own products.*

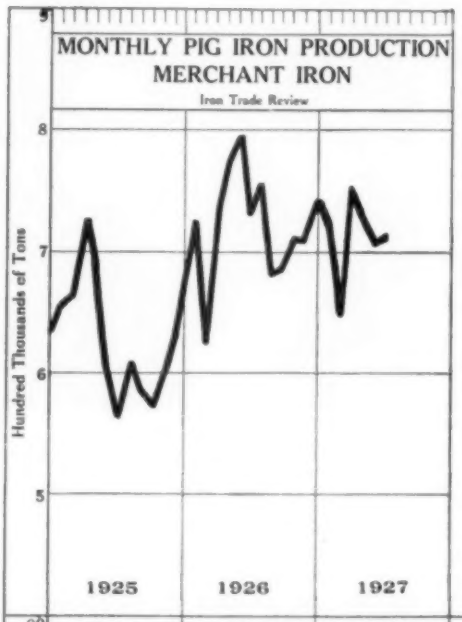
Rockefeller, Carnegie and all other philanthropists shrink into insignificance before this display of generosity. How the buyer, who plays one foundry against another in whittling prices, must welcome such an able ally, within the foundry ranks. But does even the public spirited gentleman who donates his profit know his costs and correctly gage his overhead? Of course, eventually if he underestimates these factors, the situation corrects itself. In the interim, immeasurable damage is done to the entire structure of foundry prices, and not even the buyer of the profitless castings is the gainer.

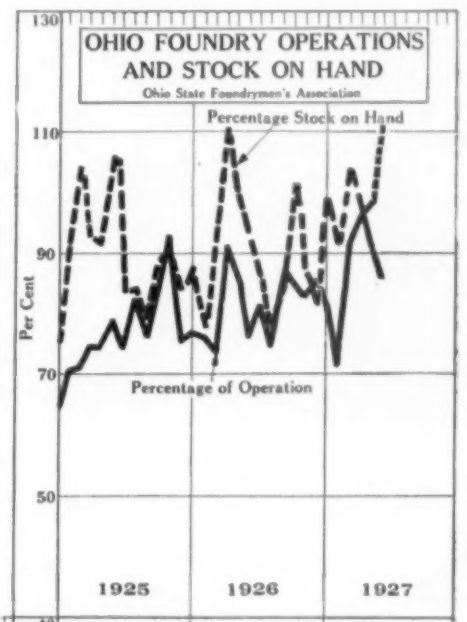
Trade Trends in Tabloid

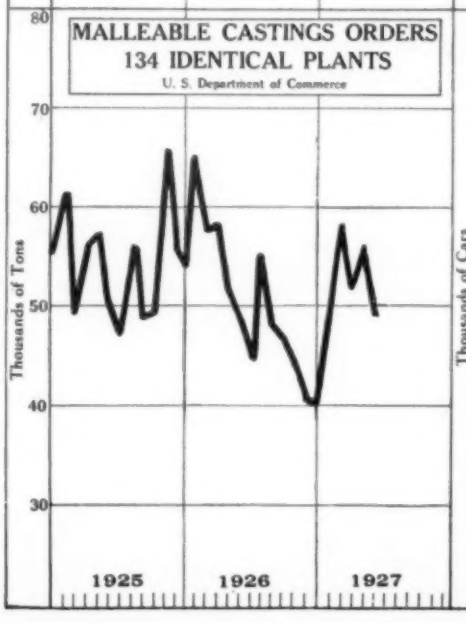
USUAL summer dullness is experienced in the foundry industry. Orders for miscellaneous jobbing gray iron, steel and malleable castings are slower, and specialty shops are experiencing something of the same condition. Exceptions will be noted among a few of the automotive shops and certain steel foundries making alloy castings for steel mill and oil field or refinery service. Automobile sales in the so-called medium price level have dropped, but the low priced cars are in greater demand. Production of all classes of pig iron showed a loss, dropping from 3,391,067 tons in May to 3,088,996 tons in June, according to the *Iron Trade Review*. However, the output of merchant iron increased, from 701,582 tons to 709,357 tons respectively, in the case of the two months mentioned. Three merchant furnaces were blown in and 2 blown out or banked during June. General manufacturing conditions indicate slow operation for July, with a probable pickup in August, or September. Average monthly New York prices for nonferrous metals in June, according to the *Daily Metal Trade* were as follows: Casting copper, 12.47c; electrolytic copper, 12.618c; Straits tin, 67.486c; lead, 6.426c; antimony, 12.365c; aluminum, 98 to 99 per cent, 25.375c. Zinc averaged 6.222c, E. St. Louis, Ill., during June. Brass foundry operations are reported slack, attending a decline in building construction in many sections.

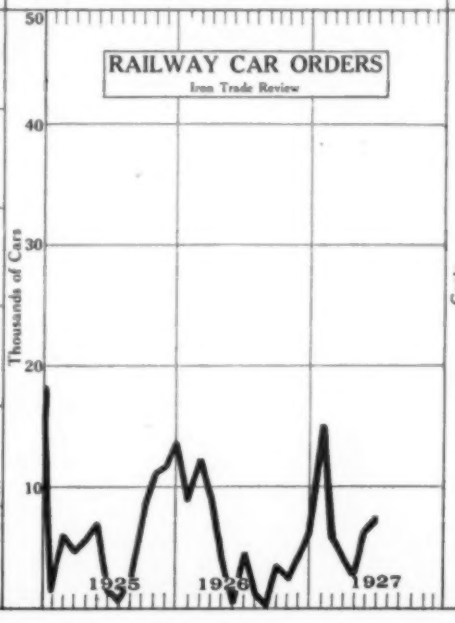
RAW MATERIAL PRICES
July 7, 1927

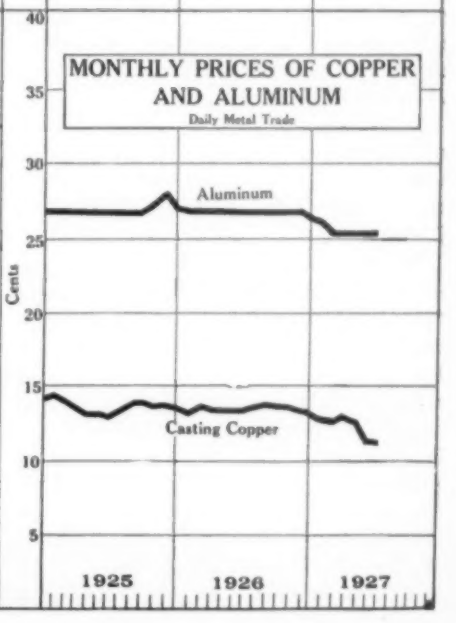
No. 2 foundry, Valley	$17.50 to 18.00
No. 2 southern, Birmingham	18.00
No. 2 foundry, Chicago	20.00
No. 2 foundry, Philadelphia	21.26 to 22.26
No. 2 foundry, Buffalo	17.00 to 17.50
Basic, Valley	17.50
Basic, Buffalo	17.00 to 17.25
Malleable, Chicago	20.00
Malleable, Buffalo	17.00 to 17.50
Coke	
Connellsville foundry coke	$4.00 to 4.50
Wise county foundry coke	4.00 to 5.00
Scrap	
Heavy melting steel, Valley	$15.00 to 15.50
Heavy melting steel, Pitts.	14.50 to 15.00
Heavy melting steel, Chicago	12.00 to 12.50
Stove plate, Chicago	12.25 to 12.75
No. 1 cast, New York	13.50 to 14.00
No. 1 cast, Chicago	14.75 to 15.25
No. 1 cast, Philadelphia	16.50 to 17.00
No. 1 cast, Pittsburgh	15.00 to 15.50
No. 1 cast, Birmingham	14.00 to 15.00
No. 1 cast, Buffalo	15.00 to 15.50
Car wheels, iron, Pittsburgh	15.00 to 15.50
Car wheels, iron, Chicago	13.50 to 14.00
Railroad malleable, Chicago	13.50 to 14.00
Agricultural, Mal. Chicago	13.00 to 13.50
Malleable, Buffalo	15.00 to 15.50
Railroad malleable, Pitts.	14.00 to 14.50
Nonferrous Metals	**Cents per pound**
Casting copper, refinery	12.37½
Electro copper, producers	12.50
Straits tin	64.62
Lead, New York	6.25 to 6.30
Antimony, New York	12.00
Nickel, electro	39.00
Aluminum, No. 12, prod'rs.	24.50
Aluminum, No. 12, remelt.	18.50 to 19.50
Zinc, E. St. Louis, Ill.	6.15











Comings and Goings of Foundrymen

GOTTFRID Olson, foundry superintendent of the Illinois Malleable Iron Co., Chicago, sailed for Stockholm, Sweden, on June 21 where he will be come plant manager of the Pump-Separator Co., at Stockholm. Mr. Olson has been with the Illinois Malleable Iron Co. for the past 10 years. Previously he was connected with the Chicago Hardware

GOTTFRID OLSON

Foundry Co., and the Manitoba Bridge & Iron Co., Winnipeg, Canada. For the past 10 years Mr. Olson has been an active member of the Chicago Foundrymen's club. He also is a member of the American Foundrymen's association and the Swedish Engineers' society.

A. H. Brown, formerly brass foundry foreman with the Illinois Malleable Iron Co., Chicago, is now associated with the Grabler Mfg. Co., Cleveland, in the same capacity.

William W. Brown now is in charge of the foundry of the Fuller Warren Co., Troy, N. Y. For several years he was connected with the Cleveland Co-Operative Stove Co., Cleveland, and resigned this position to take charge of the foundry of the Pangborn Corp., Hagerstown, Md.

Clarence M. Wooley, president, American Radiator Co., New York, has been awarded the decoration of officer of the crown of Belgium. The decoration was bestowed June 23 by Baron de Cartier de Marchienne, formerly Belgian ambassador to Washington.

George W. Kennedy, who has been president, Kelsey Wheel Co., Detroit, now is president, Kelsey-Hayes Wheel Corp., formed by the merger of the Hayes Wheel Co., Jackson, Mich., and the Kelsey company.

Bruno V. Nordberg, executive engineer, Nordberg Mfg. Co., Milwaukee, has been appointed a member of the Milwaukee sewerage commission to succeed Robert Cramer who has resigned to become chief engineer of the commission. Mr. Nordberg is a graduate of the University of Wisconsin, college of engineering, and is the son of Bruno Nordberg, founder of the Nordberg company.

Rollin Thorstenson, formerly assistant metallurgist, Lakey Foundry & Machine Co., Muskegon, Mich., now is foundry metallurgist, Nash Motors Co., Kenosha, Wis. During the war Mr. Thorstenson was chemist and had charge of the bessemer converters for the West Michigan Steel Foundry Co., Muskegon, Mich. After leaving this firm, he was chemist for the Continental Motors Co., Muskegon for five years.

R. Leslie Hunter, B. Sc., A. M. I. Mech. E., assistant works manager to M. Cockburn & Co., Ltd., Falkirk, Scotland, brass and iron founders and manufacturers of enamelled baths, received a silver tea service from the workers and staff of the company on the occasion of his marriage. Mr. Hunter graduated at Edinburgh university and after taking his B. Sc. he served his apprenticeship with Babcock & Wilcox, Ltd. He then visited America where he worked in various foundries.

Heads Own Company

Aubrey J. Grindle, formerly director and vice president, Grindle Fuel Equipment Co., Harvey, Ill., has severed his connection with that firm and established the Pulverized Fuel Equipment Co., 1238 Builders' building, Chicago. Mr. Grindle first became identified with pulverized coal equipment while with the International Harvester Co., at its Deering plant, where for a period of several years experimental work was carried on under his supervision to adapt this equipment for malleable melting and annealing furnaces.

In 1915 Mr. Grindle became associated with the Powdered Coal Engineering & Equipment Co. In 1916 he organized the Combustion Economy Corp., but due to war time conditions progress temporarily was halted when Mr. Grindle took charge of the foundries of the Stewart-Warner Co., Beloit, Wis. About 1921 the name of the firm was changed to the Grindle Fuel Equipment Co., and later became a

AUBREY J. GRINDLE

subsidiary of the Whiting Corp., Harvey, Ill.

The Pulverized Fuel Equipment Co. was organized in March 1927 and is engaged in producing equipment for malleable iron, gray iron, steel, brass, copper and aluminum melting; malleable annealing; core baking, etc.

Sell Molding Machine Plant and Good Will

Sale of the plant, machinery and good will of Harry E. Pridmore, Inc., Chicago, has been confirmed. The good will was purchased by the International Molding Machine Co., Chicago. The real estate, plant and all machinery were purchased by the Madison & Kedzie State bank, 3158 West Madison street, Chicago, the holder of the mortgage. It is understood the bank will dispose of the machinery and other equipment to the parties who bid them in at the auction of the Pridmore property, which was held recently.

Obituary

Leland M. Turner, formerly president, Turner Mfg. Co., Port Washington, Wis., and more recently general manager, Western Malleable & Grey Iron Mfg. Co., Waterloo, Iowa, died at Waterloo following an operation. He was 54 years of age and a native of Milwaukee.

Michael Seeboth, secretary-treasurer, Milwaukee Bronze Casting Co., the Seeboth Bros. Co., scrap iron, and the Albert G. Seeboth Co., textile waste, all of Milwaukee, died June 15 at the age of 75 years. He was born in Germany and came to America in 1873.

Walter Nathan Crafts, works manager, Reading Steel Casting Co. Inc., Reading plant, Reading, Pa., died June 8 at the age of 55 years. He was born on Jan. 22, 1872 at Shelby, Ala., and removed to Columbus, O., in 1878. Mr. Crafts was educated in the public schools of Columbus, and was graduated from Oberlin college with a bachelor of arts degree in 1892 and from the Massachusetts Institute of Technology with a degree of bachelor of science in 1895. Mr. Crafts had held many positions in the foundry industry including those of superintendent, Sharon plant, American Steel Foundries, Sharon, Pa.; manager, Crucible Steel Forge Co., Cleveland; general manager, British Forgings, Ltd., Toronto, Ont.; president and general manager, Canadian Electric Steel Ltd., Montreal. In September, 1924 he became works manager of the Reading company which position he held at the time of his death.

Guy E. Tripp Is Dead

Guy Eastman Tripp, since 1912 chairman of the board, Westinghouse Electric & Mfg. Co., East Pittsburgh, died at New York, June 14, following a prolonged illness. Mr. Tripp was born in Wells, Me., April 22, 1865. He attended South Berwick academy, Berwick, Me., working at the same time in a general store. When he was 18 he obtained clerical employment with the Eastern Railway Co. In 1890 he became storekeeper and later traveling auditor for the Thomson-Houston Electric Co. He joined the Stone & Webster interests in 1897 and in 1912 was selected chairman of the Westinghouse company. Shortly after the United States entered the World war Mr. Tripp was made chief of the production division of the ordnance department, and later was promoted to brigadier general and assistant to the chief of ordnance of the United States army. Mr. Tripp wrote many articles and presented numerous addresses upon power development and last fall published a book, "Electric Development as an Aid to Agriculture." He was a director of numerous industrial companies and a member of a great number of business and social organizations.

Flat Copes Are Jolted on Molding Machines

Question: Several foundrymen in this vicinity claim that jolt machines do not ram flat copes satisfactorily. Can you tell me if this opinion is shared in America?

Answer: Men to whom you refer must have jumped to conclusion hastily and without any fair demonstration. Foundrymen in the United States have been jolting flat copes successfully practically since the introduction of the jolting machine. Of course it is essential that the flasks are rigid, preferably cast iron, cast steel or pressed steel and that the bars be tapered gradually so that the sand will flow under them without the necessity of hand tucking. Also it is only fair to admit that every type of jolt machine is not suitable for ramming flat copes. However, several types are available and any person who wants to jolt ram his flat copes, easily can secure a machine to meet his requirements.

Edward J. Lavino, chairman, E. J. Lavino & Co., Philadelphia, sailed June 25 for England. He later will spend some time on the Continent and is expected to return in September.

Foundry Association Directory

American Foundrymen's Association

President, S. W. UTLEY, Detroit Steel Casting Co., Detroit; secretary-treasurer, C. E. HOYT, 140 South Dearborn street, Chicago; technical secretary, R. E. KENNEDY, 909 W. California street, Urbana, Ill.

The Buffalo Foundrymen
Buffalo

President, J. MCARTHUR, Washington Iron Works; secretary, W. J. WARK, E. J. Woodison Co., 146 Chandler street. Meetings the third Wednesday of the month at 146 Chandler street.

Chicago Foundrymen's Club
Chicago

President, G. H. ROLINSON, American Brake Shoe & Foundry Co.; secretary, ALBERT N. WALLIN, S. Obermayer Co., 2563 W. Eighteenth street. Meetings second Saturday in each month at the City club, 315 Plymouth court.

Connecticut Foundrymen's Association

President, FRED W. STICKLE, Capitol Foundry Co., Hartford, Conn.; secretary, C. S. NEUMANN, Union Mfg. Co., New Britain, Conn. Meetings are on second Friday of each month in various parts of the state.

Detroit Foundrymen's Association
Detroit

President, J. J. BOLAND, Griffin Wheel Co., Detroit; secretary, ROBERT HOPE, Holley Carburetor Co., Detroit. Meetings third Thursday in each month at the Union League club, 35 Grand River avenue, Detroit.

East Bay Foundrymen's Association
Oakland, Calif.

Secretary, H. L. MARTIN, Marchant's Foundry Co., 4401 East Tenth street, Oakland, Calif.

Metropolitan Brass Founders' Association
New York

President, WILLIAM EMBER, Jefferson Brass Foundry, 62 Delevan street, Brooklyn, N. Y.; secretary WILLIAM E. PAULSON, Thomas Paulson & Son Inc., 97 Second avenue, Brooklyn, N. Y. Meeting second Wednesday in each month at the Building Trades club, 34 West Thirty-third street, New York.

Newark Foundrymen's Association
Newark, N. J.

President, J. L. CARTER, Barlow Foundry Inc., Newark; secretary, W. H. MANTZ, Atlas Foundry Co., Irvington, N. J. Meeting called by President.

New England Foundrymen's Association

President, HENRY S. CHAFEE, Builders Iron Foundry, Providence, R. I.; secretary, FRED F. STOCKWELL, 205 Broadway, Cambridgeport, Mass. Meetings second Wednesday of each month at the Exchange club, Boston. Outings usually are held in the summer months.

Ohio State Foundrymen's Association

President, WALTER L. SEELBACH, Walworth Run Foundry Co., 2488 West Twenty-seventh street, Cleveland; secretary-manager, ARTHUR J. TUSCANY, 5713 Euclid avenue, Cleveland.

Philadelphia Foundrymen's Association
Philadelphia

President, WALTER WOOD, R. D. Wood & Co., Philadelphia; secretary HOWARD EVANS, Union League club, Philadelphia. Meetings the second Wednesday of each month at the Manufacturers' club.

Southern Metal Trades Association
Atlanta, Ga.

President, GEORGE B. COCKER, Gastonia, N. C.; secretary, W. E. DUNN JR., Healy building, Atlanta, Ga.

Pittsburgh Foundrymen's Association
Pittsburgh

President, C. D. CAREY, American Steel Foundries, Pittsburgh; secretary-treasurer, WILLIAM J. BRANT, Wm. J. Brant, Bessemer building, Pittsburgh. Meeting on the third Monday of the month, except in July and August, at Fort Pitt hotel.

Quad-City Foundrymen's Association
Davenport, Iowa

President, J. H. DIEDRICH, Blackhawk Foundry & Machine Co., Davenport, Iowa; secretary-treasurer, A. D. ZIEBARTH, Davenport Foundry & Machine Co., Davenport, Iowa. Meetings the third Monday evening of each month, the meeting place being rotated between Moline, Rock Island and Davenport.

Tri-City Technical Council
Moline, Ill.

Chairman, H. BORNSTEIN, Deere & Co., Moline, Ill.; treasurer, MAX SKLOVSKY, Deere & Co., Moline, Ill. Combined meetings held only one or two times a year on call.

Tri-State Foundrymen's Association
Cincinnati

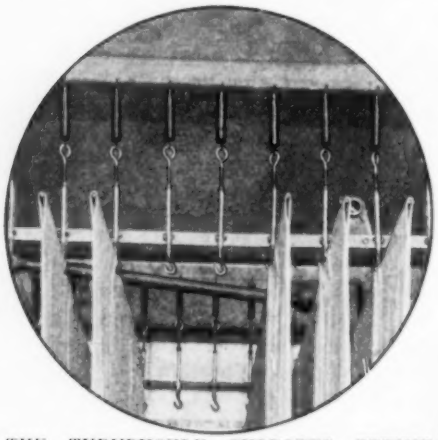
President, HAROLD P. RITTER, John A. Oberhelman Foundry Co., 3323 Colerain avenue; secretary, GEORGE W. PIEHL, Wessling Bros. Foundry Co., 1607 McLean avenue. Meetings the second Thursday of each month at the Cincinnati club, Eighth and Race streets.

Twin City Foundrymen's Association
Minneapolis-St. Paul

President, H. H. NOTT, Smith System Heating Co., Minneapolis; secretary-treasurer, C. E. LANGDON, 3849 Lyndale avenue, south, Minneapolis. Meetings monthly at the Athletic club.

Use Bag Type Filter in Dust Arrester

The New Haven Sand Blast Co., New Haven, Conn., recently has introduced a new bag type dust arrester unit which was developed by S. S. Parsons, western manager



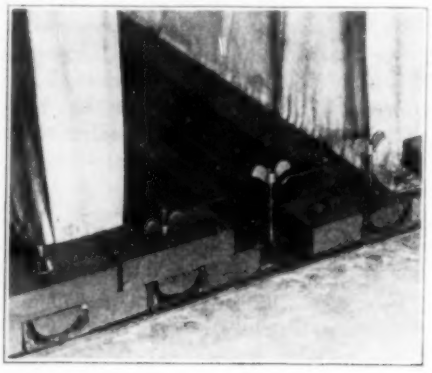
THE TURNBUCKLE SUPPORTS PERMIT ADJUSTMENT FOR TENSION

of that company. The arrester consists of a rectangular, air-tight bag house built over an inlet expansion chamber or chambers with a hopper bottom. The bag house is separated from the inlet expansion chamber by a steel partition, having a series of steel channels spaced to allow the passage of air from the expansion chamber to the bag house. These spaces are covered with a series of bags which filter the air as it is drawn by suction from the expansion chamber to the bag house proper.

The connection from the bag house to the fan may be placed on the roof of the bag house or any position at the top of the sides or ends of the house. The inlet pipe line may enter the inlet expansion chamber on either side. The bag house, partition plate and inlet expansion chamber with hopper are built of standard steel sections and panels so that additions may be made by removing the end of the chamber and adding the sections required. Ample walk-way is provided around the bag section proper in the bag house for inspection and replacement of bags.

The bag house is built of standard 16 gage steel panels, reinforced at the ends by angles, joined by double fold construction and made air tight by insertion of paper sealing strips. The panels are bolted securely to the inner, angle-iron frame, not depending on the seams alone for stiffness and rigidity. The bag house is supported on channels and an air tight junction is made between the partition plate and the sides of the house. The inlet expansion chamber does not extend to the edge of the house, but is made of a continuation of the partition plate bent down to meet the 14 gage hoppers.

Flat bags are seamed every few inches to prevent bulging when in operation and they are fastened to the bottom in an interesting manner. Two metal rods are slipped into the hem at the bottom or open end of the bag. These rods are placed in adjacent channels and clamped down by half round wood strips. Each end of the bag is brought up over the edge of the channel and sealed between two wood clamping blocks, as shown in the accompanying illustration. By unfastening four thumb screws holding down wood



THE BAG IS HELD BY TWO METAL RODS AND THE WOODEN BLOCK

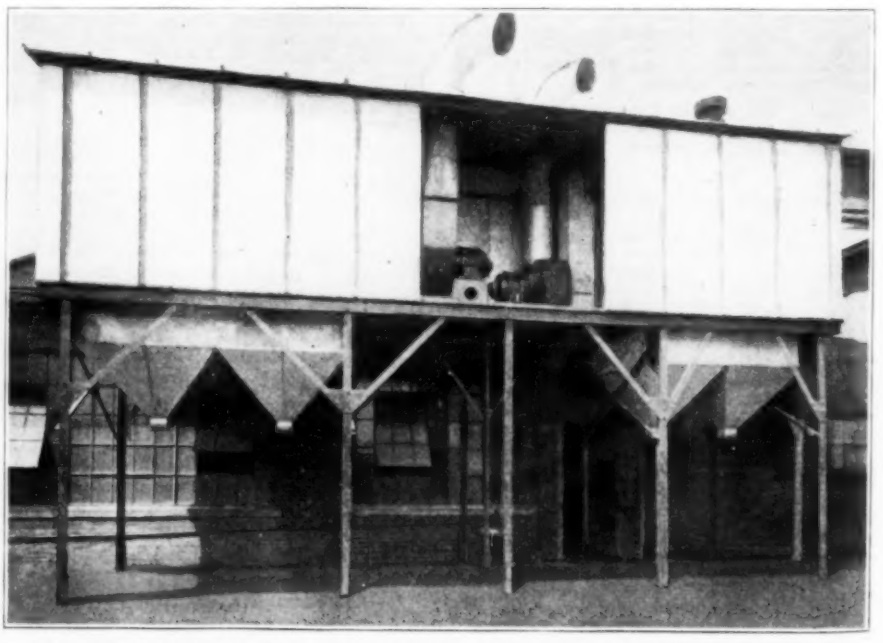
blocks and half round strips, any bag may be released.

The bag is closed by a hem at the upper end through which a rod is passed. This rod is supported at each end by a turnbuckle hook. This special turnbuckle is supported from the frame work above by a flexible spring, enabling take up for variation in length and adjustment of tension. The horizontal shaking bar passes through the center of each series of turnbuckles, which permits shaking the bags without affecting the tension. The two shaking rods are tied together by a bar in the center and are shaken by an eccentric from a gear reduction driven by a ½-horsepower motor. The support at the top is shown in the illustration at the extreme left.

All bolts, thumb screws, turn buckles and removable parts holding bags are cadmium plated to prevent corrosion. All outdoor installations are provided with a double roof. Under normal operation the shaker motor is operated twice daily for five minute periods to shake off the accumulated dust.

Appoints Sales Agents

Whiting Corp., Harvey, Ill., has appointed the following sales agents and also has made a change in its St. Louis territory: Eichman Machinery Co., Manufacturers' Exchange building, Kansas City, Mo., will handle the state of Kansas and Mercer, Grundy, Livingston, Carroll, LaFayette, Johnson, Henry, St. Clair, Cedar, Dade, Lawrence and Barry counties of Missouri. The Huey & Phillip Hardware Co., Dallas, Texas, will cover the states of Oklahoma and Texas, excepting the southeastern counties. L. H. Staley, Whitney-Central building, New Orleans, will cover the state of Louisiana, southern half of Mississippi and Mobile, Ala. H. B. Wilson Co., St. Louis, will cover the state of Arkansas but not Oklahoma.



THE UNIT IS BUILT WITH SPECIAL DUST HOPPERS BELOW THE BAG HOUSE

Use Ball Bearings on New Sand Mixer

Refinements and radical changes recently have been made in a line of sand mixing machines manufactured by the Standard Sand & Machine Co., 5151 St. Clair avenue, Cleveland, which it is claimed reduce power consumption and increases the machine life.

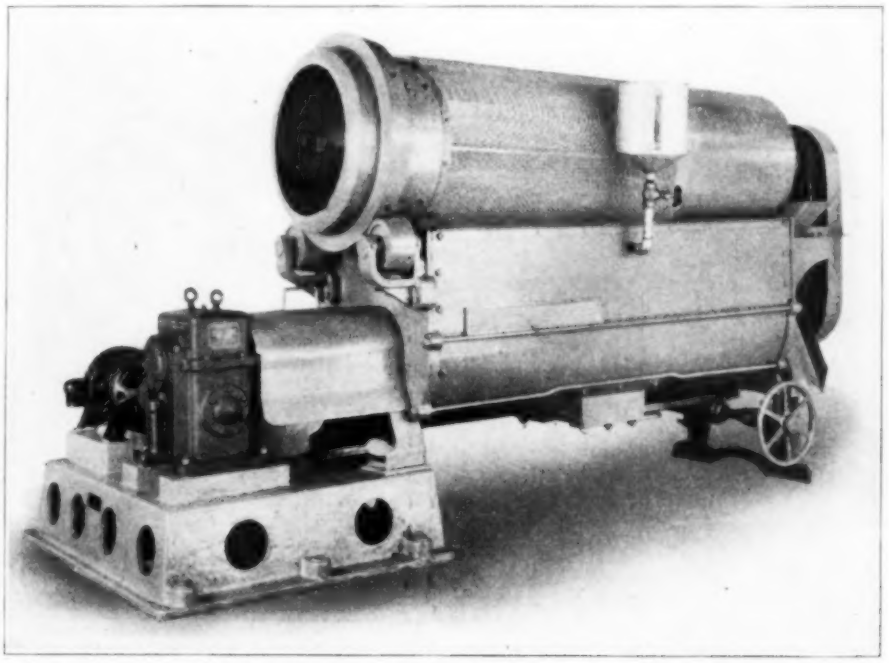
The machine is driven through a speed reducer built by the Horsburgh & Scott Co., Cleveland. The speed reducer is the worm and gear type although a spur gear reducer will be supplied when necessary. The machine is driven by a 5 horsepower motor which is mounted, with the speed reducer on a special cast base.

Roller bearings made by the Timken Roller Bearing Co., Canton, O., are used throughout the mixer and speed reducer. All gears and bearings are enclosed to protect them from the abrasive action of the dust. All contact parts are machined to secure a good fit and exact alignment.

The paddle tips, screen trunnions, tire and sprocket wheels are made of a special metal having a brinell of 600 and a tensile strength of from 45,000 to 60,000 pounds per square inch. The lining of the mixing trough, a point of tremendous wear, also is made of the special metal. The lining is ⅝-inch thick on the small machines and ¾-inch thick on the large machines and is made in three sections to facilitate removal.

The sand is worked constantly toward the center. The 36 mixing paddles are constructed to give the mixture a surf or undulating motion and the shaft speed of 30 revolutions per minute actuates 1080 paddle strokes in that time. The sand is discharged at the bottom of the trough. A rack and pinion, shown in the accompanying illustration, controls the discharge gate.

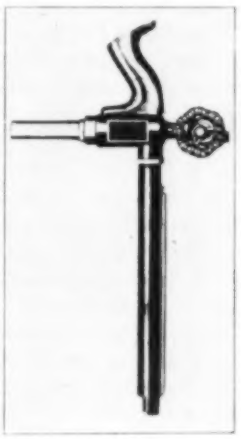
The machine is built in three sizes having a capacity of 10, 15 and 27 cubic feet per batch respectively. The same machines are built to operate continuously and deliver from one to 65 tons of sand per hour.



THE SAND MIXER IS DRIVEN THROUGH A WORM AND GEAR TYPE SPEED REDUCER

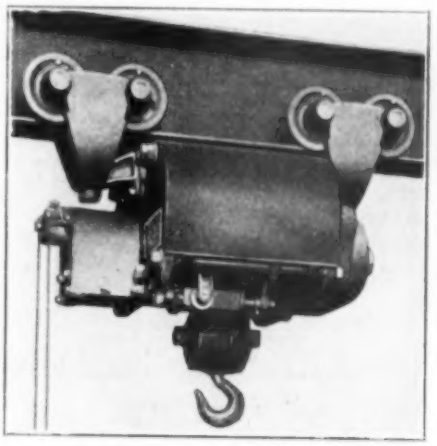
Gun Sprays Coating on Refractory Walls

The Botfield Refractories Co., Swanson and Clymer streets, Philadelphia, has introduced a special gun which is used to blow refractory coatings on refractory brickwork. This gun weighs one pound and requires one man to operate. Air or steam at 50 pounds pressure or higher, is used. Air is considered as more satisfactory. The operator connects the air line to the ½-inch standard pipe thread opening on the globe valve of the gun. He then places the supply pipe in the mixture, turns the globe valve and the gun sprays a mixture over the structure. The force of the stream always is under direct control of the operator.



THE GUN WEIGHS ONE POUND

The gun is held from 4 to 6 feet from the work, or nearer when necessary to fill cracks. One hundred pounds of the premixture is sufficient to surface a wall area 100 feet square with a coating approximately ⅛-inch thick.



THE HOIST IS MOUNTED ON AN 8-WHEEL TROLLEY

Monorail Hoist Requires Short Headroom

The American Engineering Co., Philadelphia, recently has introduced an electric monorail hoist which operates with a headroom of 15½ inches. The hoist is built in ½ and 1-ton sizes. The design is similar to another type of hoist manufactured by the company except that it is mounted on an 8-wheel trolley which reduces the headroom requirement by more than 5-inches.

The hoist is built to operate with alternating current at 20 feet per minute or direct current at 20 to 40 feet per minute. A special high speed hoist provides for operation at 40 feet per minute with alternating current and 40 to 80 feet per minute with direct current. The standard height of lift is 20 feet but when required a lift of 25 feet may be provided. Four ropes are used.

It is claimed the hoist travels around curves of short radius, shifts easily over switches and is protected from dust and moisture by metal covers. Motors are enclosed and roller bearings are used on the gear shafts and on the trolley wheels. A ball bearing motor is used. The drive between the motor and drum is the spur-gear type and runs in oil. Holding and lowering brakes give full control of the hoist at all times and combined with a positive acting upper limit device, gives safety in operation.

Publishes a Directory

Recently the department of commerce has published a directory of commercial testing and college research laboratories. The work of compilation was done by the bureau of standards and lists 207 commercial testing and 143 college research laboratories. The name and address of each laboratory is given as are the commodities tested and the nature of the tests performed. Copies of this directory which is bureau of standards, miscellaneous publication No. 90, may be obtained from the superintendent of documents, government printing office, Washington, D. C., price 15 cents.

Speed Reducing Unit Has Chain Drive

H. W. Caldwell & Son Co., Western avenue at Seventeenth street, Chicago, recently has introduced a new speed-reducing unit. Each reducer is self-contained, entirely enclosed, with the motor mounted on top of a substantial housing. The reducer is made in two styles. The first type, which originally was designed for conveyor and elevator service, is applicable to other kinds of machinery, and the second is designed for driving screw conveyors.

The reducer has a chain belt drive from the high speed shaft and a spur gear drive to the low speed shaft. The reducer is made in sizes to supply ratios from 7:1 to 40:1 for the first type and 30:1 for the second type. The chain drive and the gears are enclosed in dust proof, oil-retarding housings which keep the gears operating in a bath of oil. The cast-iron housing is constructed ruggedly to give proper support and alignment. Tapered roller bearings carried on cartridge mountings support the oversized shafts. The upper half of the first type housing may be removed without disturbing the lower half as may be noted in the accompanying illustration. The second type housing designed for driving screw conveyors is split vertically.

Introduces Sand Mixer with Revolving Pan

The National Engineering Co., 549 West Washington boulevard, Chicago, recently has placed on the market a continuous type intensive sand mixer designed for use in connection with preparing and conditioning sand in continuous sand handling systems. This mill has a capacity of from 65 to 85 tons of sand per hour, depending on the class of sand and the time required to condition it properly.

The machine has a revolving pan and the mullers and plows are stationary. The sand is fed into the machine on the outside of the pan. The machine is equipped with three plow beams each fitted with six plows. These plows may be set at any angle to regulate the time that the sand will be in the mill. The sand is guided under the six mullers by the plows. The mullers, which have an 11-inch face, are adjustable to eliminate grinding action of the sand grain if desired. The sand is worked gradually to the center of the pan where it is discharged into a belt conveyor for distribution.

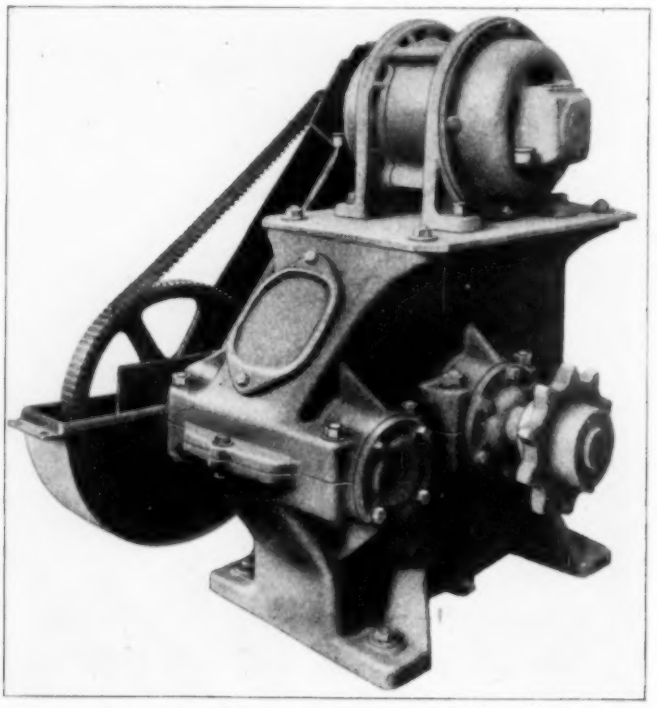
Particular care has been given to the mechanical construction of the machine. The main drive gear is a cut steel spur gear and while it requires only 30 horsepower to drive the mill, the gear has a safe load of 150 horsepower. This feature also applies to the spur pinion and cut bevel reduction gear, which runs in oil and is housed completely in an oil tight casing. All moving parts of the machine are equipped with bearings made by the Timken Roller Bearing Co., Canton, O. The pan of the mill travels at a speed of 18 revolutions per minute.

Acquires Kiln Interest

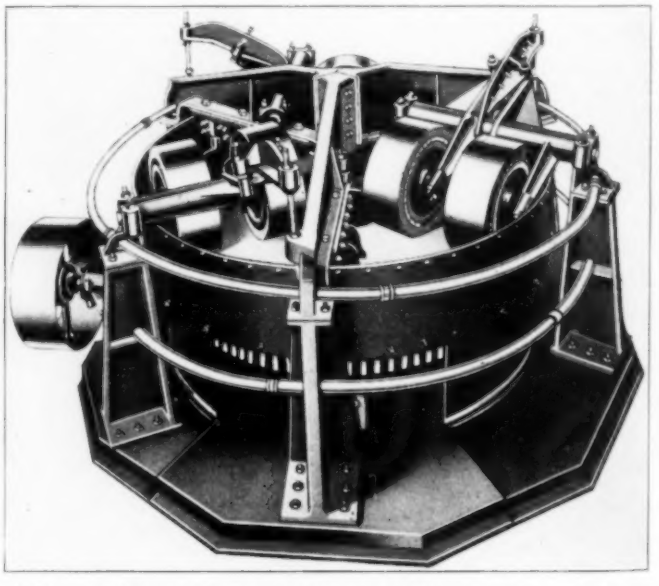
William Swindell & Bros., Pittsburgh, have acquired the Kupfer interests in the American Dressler Tunnel Kilns Inc. and E. H. Swindell is president of the Dressler company. The kilns manufactured by the Dressler company are used in iron and steel annealing and in the burning of brick and enameled ware. The offices of the American Dressler Tunnel Kilns Inc. will remain at Twelfth and Walnut streets, Cleveland.

Increasing Facilities

The Farrell-Cheek Steel Foundry Co., Sandusky, O. is building a new addition to its foundry to handle the increasing demand for its special alloy and regular run steel castings. The company which was established about 17 years ago to make small castings gradually has increased its staff and plant facilities.



THE UNIT IS ENCLOSED ENTIRELY, WITH MOTOR MOUNTED ON THE TOP



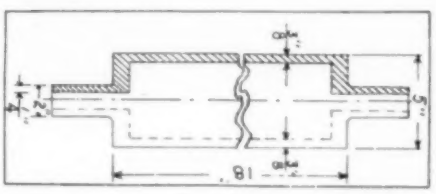
ROLLER BEARINGS ARE USED ON ALL MOVING PARTS OF THE CONTINUOUS TYPE MIXER

Difficulty in Securing Clean Castings

Question: We are enclosing a sketch of a small roller 18 inches in length, 5 inches diameter, 3/8-inch thickness of metal which is causing us trouble. The roller must machine perfectly clean all over, but we find dirty areas particularly at the junction of the neck with the body. We have made these castings in dry sand, in green sand, horizontally and vertically, but the trouble persists. We shall appreciate your advice.

Answer: Assuming that you have taken all reasonable precautions, clean runner, clean gate, clean mold, clean iron, we are inclined to the opinion that the core is responsible. It is not sufficiently vented and the metal flutters away from it at the point where it is contracted for the neck. The fluttering is only slight, otherwise you would notice it while pouring but it is sufficient to cause a porous area in the casting at that point. The wall of the castings is so thin that the metal sets before the fluttering ceases. Obviously the remedy is to provide a core that will not cause a commotion when it is surrounded with molten metal. You do not state what kind of a core you are using and we are wondering if the 1½-inch cores in the ends are pasted into the main core. If that is the case the paste is the cause of the trouble. The core should be made in such a manner that the vent can escape freely through both ends.

The sand core may be made according to any one of several accepted methods, but the following method probably will meet your requirements. Sharp sand bonded with oil is rammed in a half corebox. After the joint is scraped off flush, a channel 2 inches wide and 1-inch deep is scooped all along the center and close to each end. A channel ½-inch wide is carried through the extension forming the neck. These channels are filled either with molding sand or with unbonded sharp sand. The half core then is rolled over on a plate and dried. Afterward the dried and unbonded sand is removed from the vent channel. Two halves are made in this manner. They are rubbed face to face to a bearing and calipered for size. Then a thin film of paste is spread on the joint, the two halves are pressed together, a little thick blacking is daubed over the seam along both sides and the core is given a supplementary baking to dry the paste.



DIRTY AREAS DEVELOPED AT THE JUNCTION OF THE NECK WITH THE BODY

Faked Foundry Facts

Safe Worker

The method of making the mold depends on the available equipment and the number of castings on order. A few castings may be molded horizontally from a split pattern and turned up on end for pouring. Where a considerable number are ordered they may be rammed on end, two or four in a flask. The gating arrangement will depend on the layout of the patterns. The design of the gate is not as important as that it is perfectly clean. We suggest you try the first few castings in dry sand molds, then as confidence increases you may try the green sand.

They may be made satisfactorily in green sand molds, provided the sand is quite open. Our personal preference would be to gate the casting at the top shoulder, but nice castings also may be gated at the bottom. One important factor is that the casting must be poured with exceedingly hot iron. With proper precautions and under favorable conditions the castings could be made horizontally, but the risk is greater than in the vertical methods, particularly in green sand.

Special Type Gates for Bronze Tablets

By W. B. Jones

In a recent issue of THE FOUNDRY I read a question and answer on how to make a bronze tablet. Several methods are practiced including the one of which a description was published. However, a better method, in fact the best method with which I am familiar may be described briefly as follows:

The casting is gated on the back through three or four rows of wedge gates depending on the total area of mold to be covered. Small wedges 1½ x 1½ inches, ¼-inch at the top tapered to 1/16-inch at the bottom are located 8 to 10 inches apart in straight rows on the pattern and a thickness of sand is rammed around them to hold them in place. A length of 1-inch pipe is laid horizontally on top of each row of wedges and partly covered with rammed sand. The pipes are lifted out temporarily, so that the wedges may be removed. The pipes then are returned to place. An upright runner is placed on each pipe and if necessary slanted to a common center so that the entire set of runners may be served from one basin in which the runner may be plugged until the basin is filled. The horizontal pipes are pulled through suitable holes in one end of the flask and the holes afterward are plugged with cores.

A suitable sand is made up by mixing equal parts French sand and No. 00 Albany sand which is tempered properly, rammed hard and afterward dried. A good, deep, solid cope is essential. After the mold is closed, binders are clamped across the cope and the bars are wedged on top to prevent them from rising. Wedges should be placed between the drag and the bottom board or plate. If the bottom plate is not adjusted properly there is danger that the clamps will pull it up in some places and thus shut off the mold thickness in one or more places.

A Correction

Through an error the crane installed at the Maytag Co., Newton, Ia., described, on page 482 of the June issue of THE FOUNDRY, was credited to the Shepard Electric Crane & Hoist Co., Montour Falls, N. Y. It was made by the Shaw Crane Works, a branch of Manning, Maxwell & Moore, Muskegon, Mich.

What the Foundries Are Doing

Activities of the Gray Iron, Malleable, Steel and Brass Shops

Williams, White & Co., Moline, Ill., will build a foundry addition 115 x 300 feet.

Curtain Supply Co., Elkhart, Ind., plans to build a foundry addition. Mundie & Jensen, 39 South LaSalle stret, are architects.

Century Electric Co., St. Louis, E. S. Pillsbury, 1806 West Pine street, president, will build a 1-story foundry building addition.

Republic Foundry Co., 515-17 Reedsdale street, Pittsburgh, contemplates buying some die casting machinery.

Weber Brass Co., Cleveland, will erect a new plant at Emerald court and East Twelfth street.

Randolph Foundry & Machine Shop, Randolph, N. Y., belonging to A. J. McCullough, has been purchased by M. A. Brain.

Reliable Foundry Co., Dayton, O., has been incorporated with $10,000 capital by Walter Placke, Louis Schmolze and James Malley.

Whiting Corp., Harvey, Ill., J. H. Whiting, president, 157th street, will build a 1-story foundry and revised plans are now being drawn. (Noted April 1.)

Milford Iron Foundry, Milford, Mass., is inquiring for electric arc welding equipment, 150 to 200 ampere generator, connected to 220 volts, 60-cycle, 3-phase motor.

Master Electric Co., Linden and Master avenues, Dayton, O., has awarded the contract for a 1-story addition to be equipped as a foundry, to Huffman Realty Co., Dayton.

West Coast Foundry Co., Los Angeles, Industrial building Co., Pacific National Bank building, designers, is having plans made for proposed foundry at First and Gates street.

L. A. Beecher, 1150 Diversey Parkway, Chicago, will build a 1-story foundry building, 24 x 122 feet. E. N. Braucher, 228 North LaSalle street, is architect.

J. C. Posson, president, Medina Cold Storage Co., Medina, N. Y., has bought a half interest in the Median Iron & Brass Co., manufacturer of sewer pipe.

Stoody Co., Whittier, Calif., is installing two 1-ton electric furnaces for the manufacture of welding rods, alloy steels and equipment. An alloy steel foundry also is being established.

Zidac Products, Hempstead, N. Y., has been incorporated with $20,000 capital to engage in brass foundry business by Fleming & Hanford, Newark, N. J.

American Lawnmower Co., Muncie, Ind., George Spencer, Eighteenth and Monroe streets, president, will build a factory addition 80 x 80 feet.

American Seeding Machine Co. of New York, Syracuse, N. Y., has been incorporated with $5000 capital to manufacture agricultural machinery by Byrne, Byrne & Lowery, Syracuse, N. Y.

Oakland Motor Car Co., Pontiac, Mich., A. R. Clancy, president and general manager, has awarded the general contract for a 1-story steel foundry to Austin Co., 16112 Euclid avenue, Cleveland.

Eco-Thermal Stove Co., Lebanon, O., S. S. Thomas, general manager, is inquiring for two presses, three molding machines and other equipment for its plant damaged recently by fire.

Reliance Foundry Co., Vancouver, B. C., which recently completed a large addition to its plant, doubling the former capacity, now proposes to install a modern electric furnace for the production of steel castings.

Peerless Mfg. Co., Louisville, Ky., Lawrence Jones Jr., secretary, 423 West Main street, has acquired the O. K. Stove & Range Co., Brook steet and Gaulbert avenues, and will start production soon.

Union Metal Mfg. Co., 1432 Maple avenue, Canton, O., makers of metal standards, lighting and punch columns, plans to build a 1-story factory, 50 x 100 feet, R. O. Karchner is engineer.

American Brass Mfg. Co., 1525 East Forty-ninth street, Cleveland, is inquiring for 6 bussing and polishing machines for its proposed 2-story addition 20 x 70 feet, to its factory.

Lattimer-Stevens Co., 72 Yale Oak street, Columbus, O., E. M. Stevens, vice president, maker of meters and metal products, is inquiring for 6 molding machines for its new plant on Marion road.

Ideal Valve Mfg. Co., Hartford, Conn., has been incorporated with $50,000 capital to manufacture valves for plumbing, by John J. Langdon, Thomas J. Malone and Joseph S. Fowler.

Detroit Gray Iron Foundry Co., Detroit, Harry H. Wyatt, 6403 Wight street, secretary and treasurer, has awarded the general contract for a 2-story foundry building to Max Bartholomaei Sons & Co., 1574 East Warren avenue. (Noted June 15.)

Canadian Stoker Mfg. Co. Ltd., Calgary, Alta., has been incorporated to carry on the business of iron and steel founder, metal worker and machinist, with $150,000 capital stock by Otto F. Hammill, Claude E. Knowler, Clayton H. Harden and others.

Turner Jones, Talladega, Ala., one of the promoters of the new Talladega cast iron high pressure pipe shop, will purchase equipment for the foundry, which will be erected in the near future. Operation of the plant is expected in October.

Michigan Architectural Pattern Co., Romeo Mich., has been incorporated with $10,000 capital to manufacture metals and tools, and conduct a general machine shop business, by Michael L. E. Jensen, James Vevoda and Clarence Z. Hubbell, Romeo.

Health Aluminum Co., Detroit, has been incorporated with $2500 capital to manufacture aluminum and other metal castings by R. E. MacDonald, 16410 Hamilton avenue, Detroit; John H. Verkler and Joseph M. Liebig, Peoria, Ill.

Herron Stove & Foundry Co., Chattanooga, Tenn., H. L. Thatcher, 1910 Central avenue, general manager, recently incorporated, has leased the property of the American Brake Shoe & Foundry Co. and will occupy it for a new foundry.

Keystone Foundry Co., Plymouth, Ind., soon will begin operations. It is expected that between 35 and 40 men will be employed. Louis E. Keen, formerly general superintendent the Wanner Malleable Castings Co., Hammond, Ind., will be in charge.

Textile Machine Works, Reading, Pa., is starting on its new foundry building, 250 x 800 feet. The old foundry may be converted into a machine shop upon the completion of this newer one, which however is expected to take 18 months.

Rundle Mfg. Co., Twenty-seventh and Clevelan avenues, Milwaukee, maker of plumbers' and steamfitters' supplies and materials, will make improvements costing $30,000, including a new engine room, 45 x 54 feet; an enameling room, 61 x 112 feet; a foundry, 73 x 83 feet, and a shop addition, 24 x 112 feet.

Evansville Malleable Castings Co., Evansville, Ind., a notice of whose incorporation was published in the July issue of THE FOUNDRY, has bought the plant and business of the Berryhill Malleable Iron Co. and will manufacture malleable castings. A. S. Anderson is general manager.

Amalgamation of the recently dissolved Urich Foundry Co., Erie, Pa., with the Erie Malleable Iron Co., which has owned the former company since 1920, but has operated it as a separate corporation, just has been effected according to officials of the parent company. The new unit will be operated under the name of the Urich Foundry division.

Negotiations are reported under way for the consolidation of a number of large radiator manufacturing companies. Included in the proposed merger, it is said, are the National Radiator Co., New York; the Union Radiator Co., New York; the Niagara Radiator & Boiler Co., North Tonawanda, N. Y.; the Utica Heater Co., New York; the Gurney Heater Mfg. Co., Boston, and the Pierce, Butler & Pierce Corp., New York.

New Trade Publications

CONVEYORS—Handling things from where they are to where you want them, is the text from which Link-Belt Co., Chicago, has developed an illustrated booklet. It illustrates how the company's conveying devices can be utilized to move materials and place them in positions they should occupy. A wide variety of installations is shown.

WELDING EQUIPMENT—Smith Welding Equipment Corp., Minneapolis, has issued a 55-page catalog showing the line of welding equipment manufactured by this firm. Welding and cutting outfits, generator outfits, torches, tips, preheating torches, regulators, etc. are described. Illustrations of each type of equipment assist in visualizing the particular part.

LIFT TRUCKS AND STACKERS—Lewis-Shepard Co., Boston, is circulating a bulletin covering its line of special purpose trucks and stackers and various types of platforms and boxes for use with them.

GALVANOMETERS—Leeds & Northrup Co., Philadelphia, manufacturers of electrical measuring instruments, has issued a catalog of its galvanometers. It is well-illustrated and full descriptions and data are given.